CIVITAS
Cleaner and better transport in cities

SMILE
MALMÖ • NORWICH • POTENZA • SUCEAVA • TALLINN

D3.2
Final Evaluation Report

Authors: Alan Lewis, Joze Stivan and Samantha Jones,
Transport & Travel Research Ltd

With contributions from:

Joe Strahl, MAH
Stina Johansson, LTH
Andy Watt, Norwich City Council
Tiit Metsvahi & Mall Villemi, TTU
Antonella Fittipaldi, S.A.T. Società di Assistenza Tecnica - Comune di Potenza
Nicola Tamma, Ecosfera S.p.A.
Dan Dura & Narcisa Nenec, Suceava Municipality
Angela Hull, James Morgan & Sotiris Thanos, Heriot Watt University

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Introduction

This document is the Final Evaluation Report of the CIVITAS SMILE project. The report provides an explanation of the approach taken in the evaluation of the CIVITAS SMILE project and a detailed presentation and analysis of the project results of the measures implemented in the CIVITAS SMILE project.

CIVITAS - cleaner and better transport in cities - stands for CIty–VITAlity–Sustainability. With the CIVITAS II Initiative, the EC aims to generate a decisive breakthrough by supporting and evaluating the implementation of ambitious integrated sustainable urban transport strategies that should make a real difference for the welfare of the European citizen.

The objectives of CIVITAS are:

- to promote and implement sustainable, clean and (energy) efficient urban transport measures
- to implement integrated packages of technology and policy measures in the field of energy and transport in 8 categories of measures
- to build up critical mass and markets for innovation

CIVITAS SMILE (Towards Sustainable Mobility for People in Urban Areas) was one of the four CIVITAS II projects. SMILE was a four year European project that involved a total of 32 partners during the course of its life[1]. The project involved the implementation of 51 demonstration measures.

The project was structured around two leading cities, Malmö (Sweden) and Norwich (UK) with three follower sites, Tallinn (Estonia), Suceava (Romania) and Potenza (Italy). The CIVITAS SMILE cities typify the urban policy issues facing the many historic medium sized cities in the European Union and in Accession Countries, providing a significant potential for transferability of results.

The overall project strategy, linked to that of the overall CIVITAS II programme, was to combine a set of measures to develop an intelligent, sustainable and intermodal urban transport solution that makes it possible to live an active life independently of use and ownership of private cars. The individual measures are presented in eight workpackages according to the topic area headings of the CIVITAS II programme.

Evaluation has formed a key part of SMILE. Section two of the report provides the context for evaluation within CIVITAS as a whole and how this was translated into the actual evaluation of CIVITAS SMILE, initially as an overview of evaluation activities at the site and then more details for each measure to be implemented at the site in question, as previously detailed in the project's Evaluation Plan.

The objectives of the project evaluation were to:

- Co-ordinate and manage project evaluation activities at all levels of the project within time and budget restraints through an efficient planning and monitoring process
- Ensure efficient liaison on evaluation issues with GUARD, the SMILE project office and management board and the demonstration sites
- Assess and transfer the impacts of the demonstrations through the efficient output from the evaluation workpackage to workpackage 4 (dissemination, exploitation and training).

[1] During the course of the project three partners withdrew and three partners joined the consortium for various reasons.

- Establish the effectiveness of SMILE measures in terms of:
  - the direct impacts of the individual measures
  - the indirect impacts of groups of measures where appropriate
  - the potential future direct and indirect impacts of the individual measures:
  - the potential cumulative impacts of rolling out the measures to the city scale

When combined with the overall project objectives which defined the technical content of the activities the result was a detailed and comprehensive framework for the evaluation which was designed to lead to well-defined results, useful for both evaluation and as an input to dissemination and exploitation.

The delivery of the evaluation has involved following two separate, but linked work streams focused on:

(i) Technical aspects

(ii) Process aspects

However, within this final report the results have been amalgamated to provide a single set of coherent results, conclusions and recommendations.

A core set of 28 indicators covering five evaluation areas (economy, energy, environment, society and transport) were used as a common point of reference for the evaluation of all the CIVITAS II projects. The selection of which indicators would be used to evaluate each of the individual measures, and to what specification, was made by the site evaluation managers in discussion with the project evaluation co-ordinator and the site managers.

The evaluation process involved three sets of data that related to three different situations in relation to the project implementation - the before (baseline) situation, a do nothing (business as usual) scenario and the after (ex-post) situation. In this way it was expected that the impact of the measure could be separated from the impact of other influencing factors within the context of implementation. The evaluation provides data and appropriate analysis on a measure by measure basis, tabulated according to the chosen indicators for each measure. The data and analysis presented for each measure consists of some or all of the following, depending on various factors such as the extent and nature of the data, the implementation timescale and the indicators that were considered relevant to the measure:

- the baseline values (as collected from before surveys or existing data)
- the business as usual scenario value (the baseline value, modified where appropriate according to the guidelines to the business as usual scenario) to provide an estimate of the after situation if the SMILE project had not been implemented
- the actual after value (as collected from after surveys or ongoing data collection)
- the absolute and percentage differences in the do nothing vs. after comparison for each measure / indicator combination
- the absolute value of the cost effectiveness coefficient for each measure / indicator combination, calculated as the absolute differences in the do nothing vs. after comparison divided by the absolute cost of implementing the measure within SMILE
- any additional comments or explanations that are appropriate to put the numerical results in context; e.g. definition of the scale of the implementation or the relationship between the measure and the overall transport system.

A range of analysis techniques have been applied to the results of each measure in order to reach the final assessment. These include upscaling, cost effectiveness assessment, cumulative effects assessment and transferability assessment.

Chapter three presents a summary of the evaluation results on a measure by measure basis. The presentation of results is grouped on a city by city basis. For each measure the summary of the results taken from the full evaluation template is followed by a summary of / the whole of each measure's transferability assessment and for most but not all of the measures a cost effectiveness assessment. The full evaluation templates for all measures are available as annexes to this report.

Chapter 4 considers the broader effects of the SMILE measures are considered for each participating city. The format of the analysis varies slightly from city to city, which reflects the greater scale of the measures and associated evaluation data in Malmo and Norwich - the lead cities within SMILE - and reflects the fact that the breadth of the data available in Malmo and Norwich allows a more detailed assessment within a broader range of sub-categories.

Chapter 5 draws together the results of the measures within each technical workpackage across all five sites and investigates the similarities and differences in results between them. This includes brief reference to each measure's impact evaluation, process evaluation, upscaling potential, cost effectiveness, transferability assessment in order to draw out common themes and differences between the measures in each workpackage.

Chapter six draws together the main points that have emerged from the CIVITAS SMILE project in terms of the impacts attributed to the demonstration measures and processes undertaken to achieve these results. This is split into three sections

- the main conclusions of the evaluation, drawing on the material contained within the preceding chapters
- reflections on the evaluation methods and processes that have been used to reach this point and offers some observations that may be helpful when considering evaluation in similar contexts in the future
- policy recommendations regarding future development and application of measures in the context of sustainable transport policy and related initiatives.

Conclusions

The analyses of the measures individually, within the city contexts and by workpackage, have confirmed both the impacts of the individual measures but also the variations and linkages across the wide range of measures that have been implemented in the partner cities.

- Significant, quantified impacts have been identified within the project duration for many of the measures particularly in workpackages 5 (clean vehicles), 6 (access restrictions), and 11 (Soft Measures).
- The measures in workpackage 7 have also been shown to have a quantifiable potential, but over a longer time period due to the nature of the measures in influencing the gradual replacement of the overall private vehicle fleet.
- The small scale of intervention, the diffuse / indirect nature of the impacts and the different characteristics of the three measures in workpackage 9 (new forms of vehicle ownership) have made it difficult to draw consistent conclusions about this type of measure, although they do show promise.
- The measures in workpackages 8 (public transport) and 12 (telematics) have generally been found to be supporting measures for which isolating a direct quantifiable impact within the broader

context of a city's transport system is difficult. However, public surveys have shown these measures to be well received and to contribute to modal change, although in isolation or at a limited scale their impact would not on their own be enough to produce a noticeable effect at the city or possibly even route level.

- Finally the measures in workpackage 10 (freight) have proved to be the most disappointing, with only marginal impacts being observed for one or two measures.

When considering the impact of the measures in the workpackages that were relatively more successful:

- The clean vehicle and fuel measures have generally been successful in delivering emissions reductions both in terms of greenhouse gas reductions and local air pollutants, although there are variations between fuels, with a marginal increase in CO_2 emissions for the CNG buses in Potenza to be offset against the local air pollutant benefits.
- In combination with this the behavioural change measures have generally been successful in achieving substantial changes in behaviour, with the resulting greenhouse gas reductions being easier to identify (due to their direct link to fuel use) with direct changes in local pollutant emission and consequent air quality impacts being harder to identify.
- For the access control schemes that have delivered significant reductions in local air pollutants there is a strong element of supporting measures in order to help the access control schemes reach their goals. This comes as a mixture of higher level, long term policy formation and intervention (outside the formal SMILE project definition) and measures specifically defined and delivered within SMILE. Examples include:
  - The policy decision in Malmö to invest in gas powered buses within the urban bus fleet which has been implemented over a number of years to ensure complete fleet compliance.
  - The subsequent upgrade to vehicle gas in Malmö, done in conjunction with SMILE, so that 50% of the gas requirement for public transport is now from renewable sources.
  - Part-funding for retrofitting of vehicles that use the Norwich Low Emission Zone with particulate traps and / or selective catalytic reduction devices, so that they meet the NOx and particulate emission criteria laid down for access to the zone.
  - Eco-driving training to 90 bus drivers who regularly work on services passing through the Norwich LEZ.
  - Research into biodiesel and the impact of NOx levels within the Norwich LEZ.
  - Investment in the new public transport vehicles in Suceava and their subsequent conversion to LPG using SMILE co-funding.
  - Supporting investments in public transport priority measures in Suceava.

The effect on the sustainable transport system of access control measures, which are effectively detailed policy interventions that dictate a public and market response, is comparable to that of the other group of pure policy interventions – the pricing measures. Again to be successful these need to be aligned with what is achievable within the local market. The intervention in Malmö which focused on clean vehicles was appropriately targeted because of the greater maturity of and greater financial support for the clean vehicle market in Sweden, and is likely to have a greater effect that had the measure been replicated in Norwich. The intervention in Norwich, which targeted fuel savings by promoting smaller cars was again appropriately targeted because it was adapted to local conditions and a mechanism that was available to be changed.

Many of the measures work in a synergistic way, as has been identified throughout the report. The ways that this will ultimately be felt for the types of measures implemented in CIVITAS SMILE are:

(1) Reductions in car kilometres

(2) Changes in modal shift to more sustainable modes

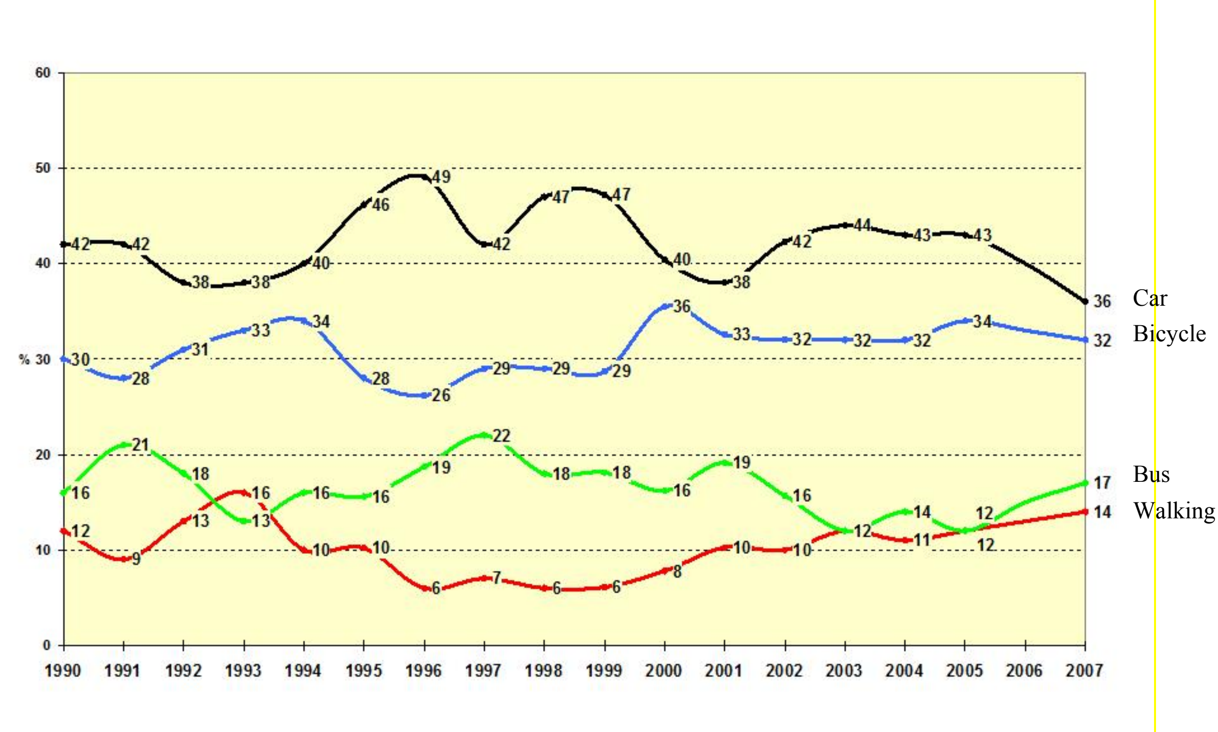
(3) Lowering in atmospheric pollutant levels.

The problems with using these indicators directly are:

- within a city environment the scale of the intervention of a demonstration project is limited compared to the scale of the wider economy, which means that the effects, even of a relatively large project such as SMILE, can be swamped by other changes to the transport system
- these indicators are also directly related to changes in the wider economy; this influence has already been seen in Tallinn and Suceava where growing prosperity has led to increased car ownership and use, so driving modal share away from sustainable means. Similarly increasing economic prosperity and population have both been directly linked to increases in the overall demand for transport (both by people and goods) and hence increases in emissions.

Therefore SMILE is to some extent working against the macro level business as usual trend (except in times of recession) and at a level where the evaluation at a project would be subject to too many external variables to be able to provide definitive results.

That said, Figure 6.1.1 provides evidence from Malmö that the combination of the SMILE measures, with other policies and external factors acting on transport in the city is having the desired effect by illustrating the ongoing development of modal share in Malmö. The sample size is too small for statistical conclusions to be drawn, but is promising to note that car use has gone down by 7% from 2005 to 2007, when it reached its lowest point of 36% for the last 18 years. There is also a comparable increase in bus use of 5% for the same period (2005 to 2007), as well as an increase in walking and relatively stable share for cycling. A similar trend is picked up by the larger 5 yearly surveys conducted in 2003 and 2008 which have more statistical weight.



(Source: Skånetrafiken, annual telephone survey of 500 people, for work/school trips during the winter season)

Figure 6.1.1: Modal Split in the wider area of Malmö (main transport mode per person)

Table 6.1.1: The Trend PT Passengers from 2004-07 in Malmö

Time period	Number of passengers	Increase
Jan-04 to Dec-04	25 133 891	--------
Jan-05 to Dec-05	25 407 269	1,09%
Jan-06 to Dec-06	27 319 571	7,53%
Jan-07 to Dec-07	29 163 239	6,75%

Source: Skånetrafiken

The fact that bus use has increased as shown in Figure 6.1.1 and confirmed in Table 6.1.1 suggests that the bus related SMILE measures (8.1, 12.1, 12.3 and 12.7), may have had a positive effect, although the biggest change to pubic transport in Malmö in recent years – the actual reorganisation of the bus routes rather than the marketing of the change – was not formally a SMILE project element.

Additionally, these data do not show the development of total travel in Malmö in the period to gauge the wider context, as total car kilometres travelled may actually also be rising.

As was identified in chapter 5, the measures with the most significant quantified benefits were as follows:

- Based on the evaluation of the measures as implemented in SMILE, the five measures that appear to have contributed most to reducing CO_2 emissions are:
  - Measure 11.3, travel planning in Norwich, which delivered annual reductions of 1134 tonnes CO_2;
  - Measure 5.2, biogas on the net in Malmö, which delivered annual reductions of 431 tonnes CO_2 within the project period, but has inherent capacity to increase this to 1121 tonnes CO_2 per annum;
  - Measure 11.9, heavy eco-driving in Malmö, which delivered annual reductions of 634 tonnes CO_2;
  - Measure 5.4, sustainable biodiesel supply chain in Norwich which will deliver annual reductions of around 600 tonnes CO_2 in the Anglian Bus fleet;
  - Measure 7.2, influencing the choice of vehicle towards smaller and more fuel efficient vehicles in Norwich, which is a long term policy measure with the potential to reduce annual CO_2 emissions by anywhere between 300 tonnes on a cautious scenario and 2742 tonnes on an optimistic scenario.
- The four measures, as implemented in SMILE, that appear to have contributed most to reducing local pollutants emissions (NOx and PM_{10}) are:
  - Measure 6.2, Low Emission Zone in Norwich, which delivered annual reductions of 10,000 kg NOx and 430 kg PM_{10};
  - Measure 6.1, extension of the environmental zone in Malmö, which delivered annual reductions of 19,700 kg NOx and 370 kg PM_{10};
  - Measure 5.6, renewal of the bus fleet to operate on LPG in Suceava, which delivered annual reductions of 6,163 kg NOx and 386 kg PM_{10};
  - Measure 5.5, purchase of four CNG buses in Potenza, which is estimated to deliver annual reductions of 3,933 kg NOx and 63 kg PM_{10};

When considering cost effectiveness, in terms of CO_2 emissions, for the measures where is was possible to quantify this, the most promising measures are:

- Measure 5.2, biogas on the net in Malmö;
- Measure 5.3, biogas HGVs in Malmö;
- Measure 11.9, heavy eco-driving in Malmö;

all of which have shown a cost reduction for the implementing partner in association with the CO_2 reductions delivered by the measure. These measures have shown a win-win scenario within the cost effectiveness assessment because the cost reduction can be identified by the organisation responsible for making the investment within the project.

Two other measures, 11.3 (travel planning) and 11.4 (car pooling), both implemented in Norwich, have provided enough data to show that the overall cost for the full stakeholder group would be negative, so also delivering a win – win scenario. However, the cost savings that make this possible are the reduced fuel costs of the individuals who have participated and changed their behaviour, and which have not been captured directly in the cost effectiveness figures at the measure level.

Finally the policy measures 7.1 and 7.2, which involve the use of parking charge policies in Malmö and Norwich to influence public behaviour towards purchasing clean vehicles over a longer timescale, also appear to score well in cost effectiveness terms. This is in part due to the fact that the cost of implementing the change is largely borne by the individual rather than the implementing authority. However, because these measures are based on an investment on a rolling basis as the fleet is renewed and largely involve looking for incremental rather than step changes in purchasing patterns then the overall cost impact should be modest.

When looking at the cost effectiveness, in terms of local pollutant emissions, for the measures where is was possible to quantify this, the most promising measures are:

- Measure 5.5, purchase of four CNG buses in Potenza;
- Measure 5.3, biogas HGVs in Malmö;

both of which have shown a cost reduction for the implementing partner in association with the observed NOx / PM_{10} reductions delivered by the measure. However, measure 5.5 is associated with a 12.5% increase in CO_2 emissions, and so should be viewed with caution unless this is considered acceptable due to acute local air quality problems or if an alternative way of reducing CO_2 emissions can be found, for example the use of biogas instead of CNG.

Measure 5.7 – the promotion of LPG to commercial and fleet operators – also scores well from a cost effectiveness perspective, and vehicle owners should also benefit from a lower fuel cost, which is again not captured within the project level cost effectiveness assessment.

Of the policy measures 6.1 and 6.2 appear promising from a local authority perspective, but care must be taken in this regard because the investment in the technology required to meet the emission standards that are set for the zones is likely to be required of vehicle operators rather than the local authority, (although they may also be an operator of municipal vehicles that would need to meet the scheme criteria).

Finally, when considering cost effectiveness results it is important to note the way in which investment costs are considered, because some organisations may be able to defer these costs to an annualised basis, as has been done in the project cost effectiveness analysis, whereas for others the size of a single investment may in itself be a barrier than cannot be overcome.

There are many examples of measures working together to meet common outcome objectives. Two prime examples are:

- the way that access restrictions link with other clean vehicle, clean fuel, car ownership and charging and travel information measures in the partner cities, as has been detailed earlier in this section;

- integration of public transport provision (route network), quality (e.g. safety and security), information (mobile internet and real time info), priority (infrastructure and telematics) and publicity.

The upscaling analyses have shown that there is significant potential for expansion of many, though not all, of the measures. This is in part due to the experimental nature of many of the measures where to fully implement would have been an excessive risk without a prior demonstration phase, but also because the finances needed for a full scale implementation are in many cases prohibitive unless the financial investment can be phased.

The importance of collaborative approaches has been clear throughout the project, from initial inception of the project and its measures through to delivery and evaluation. Partnerships have not always worked, as seen by the changes that became necessary in Potenza, with a change in public transport provider during the project. The approach required to working in partnership is perhaps one that is slightly different to the norm in the transport field, where a hierarchical, contractual arrangement is often more common.

A relationship that is perhaps more difficult is to get organisations that are not used to working together to agree on making progress towards sustainable transport goals. This is the case for example when implementing voluntary workplace travel plans. The tensions in this type of working can be seen in comments from private sector organisations about the balance of investment and benefits lies, but part of the route to success in this case is to identify the benefits and motivating factors for organisations to participate; this could lead to the development of a business case for participation, which will always carry more weight for a private sector organisation than corporate and social responsibility on its own. (This process mirrors the need to understand the motivational aspects of a travel behaviour campaign aimed at individuals, identifying the different things that will make a difference to that specific person.)

CIVITAS is primarily focused on urban transport. However, it is very difficult to consider the urban transport in isolation from the wider regional perspective. This is reflected both in the formation of the SMILE partnership, which includes a range of regional authorities and one regional transport authority, and also in the measures, many of which have a regional rather than purely urban perspective.

The value of communication and information measures is often overlooked in terms of how they can help to make best use of existing services and infrastructure. The experiences of implementing the measures in workpackage 11 clearly addresses this and shows, again, the benefit that can come from making sure that people base their travel decisions on the full facts. However, the temptation to rely solely on information and marketing also needs to be resisted. People will only buy any service or product if it works; and in the transport this relies on a sustainable transport option being present that meets several other basic criteria, including convenience, cost, reliability safety etc. As in so many aspects of this project and these conclusions we again reach a position where no one single solution is the panacea to sustainable transport – a full integrated, approach is needed – as if CIVITAS were expanded 100 times so that instead of being a demonstration programme it were the norm!

There are clear differences in the fiscal regimes that exist between the countries / cities, which have a clear influence on the way in which measures can be implemented and what can be pursued. For example:

- One of the most promising measures in Malmö has been the deployment of biomethane infrastructure for refuelling vehicles either directly or via use of the gas grid as a transfer means. However, this is dependent upon the level of financial support (reduced fuel duty) for this renewable fuel according to the national fiscal regime, and certainly in the UK this measure would not have been treated in a comparable manner had it been implemented in Norwich during the SMILE contract period. Similar issues would mean that in the UK biodiesel at blends higher than

5% blend are discouraged in the bus fleet due to the duty regime, even though the SMILE research has indicated that a 20% blend provides the best balance between local air quality pollutants, operational issues and greenhouse gas emissions.

- It appears to be accepted practice in Italy for demand responsive transport services to be granted local subsidy to ensure provision of inclusive public transport to the remote parts of the regions. This comes at a significant cost (the estimate in Potenza was annual operating costs of around €100,000), which would be seen as difficult to justify in other locations where there are different public expectations and demands on local authority budgets.

Recommendations

The recommendations section has been structured to follow the headings agreed for contributions to the CIVITAS final conference held in Toulouse in January 2009. However, an additional heading 'Technical Recommendations' has been added to provide guidance based on the technical conclusions.

Throughout these recommendations it is important to remember that mobility is a derived activity; travel is something that people do in order to reach some other objective, even if it is merely going for a walk or a drive, then they do so in order to gain satisfaction and pleasure of to derive a health benefit from the activity. Because of this, issues around transport are affected by other aspects. For example, economic cycles and other policy decisions as well as personal preferences and personal financial considerations all combine to influence overall levels of transport demand, the degree to which this demand can be met, the distances that need to be travelled and the choices over mode used and whether a journey is actually made. This all means that transport policy cannot be viewed in isolation from other aspects of public policy, as has been noted earlier in this report and is reflected in the links with for example, land use policy development within the SMILE cities.

Provision of Political, Policy and Regulative Support

Political backing has been shown to be a key success factor in delivering the innovative sustainable transport measures within SMILE. Without such backing it can be difficult to mobilise the effort, co-operation or budget necessary to break from the norm. This is also important when attempting to get collaboration from different departments even within the lead organisation, as was found in Malmö when attempting to release staff to attend eco-driving training. Therefore:

- Clear, unambiguous direction from senior staff and politicians is needed about the priority to be given to clean, sustainable transport.

It is clear that certain institutional frameworks can help with this, for example in the situation where mayoral authority is the key to action within a municipality.

Similarly, national and international legislation that places a statutory duty to meet certain targets or follow certain procedures ensures that issues are prioritised.

Relevant examples of this include:

- the local air quality regulations that place responsibility for monitoring and action on the local authority
- the recent proposals that public institutions should consider full life-cycle costs and environmental impacts when purchasing or leasing vehicles or specifying transport services.

These actions are in direct coherence and synergy with the priorities and activities of SMILE.

Broader regulation and targets are also important, as they can influence the way a measure can be implemented. The influence of regulations, sometimes in seemingly unrelated areas, can have an impact. This ranges from European legislation, where the biofuels directive has been a driving force for low blend biofuels, but has not necessarily helped high blend trials or differentiated between fuels on sustainability grounds, to local planning conditions, where the terms and costs of licensing regulations were enough make a pedestrianisation scheme in Norwich less favourable for the local traders. National air quality targets that were applied in central Norwich potentially presented a barrier to the integration of biofuels and vehicle-based emissions reduction technology within the low emission zone. Thankfully the hard work of the University of East Anglia to conduct the necessary fundamental saw this combination of fuel and technologies come to fruition to provide maximum environmental benefit.

- Ideally innovative demonstration projects such as CIVITAS can help to drive and form new national standards, as has been the case with Malmo participating with the other main cities in defining a Swedish standard for low emission zones.

The presence of a well planned and documented transport and environmental strategy has been shown to be beneficial by providing a structure for the inclusion of innovative measures, providing that the structure is well integrated across a range of areas such as land use planning, environment and transport and flexible enough to allow variation and innovation.

It is clear that this was the case in both of SMILE's main cities (Malmo and Norwich) and this was undoubtedly one of the factors that initially facilitated the successful bids from these cities and then enabled them to implement the wide range of actions required of them within the project.

During the course of the projects other SMILE cities, notably Suceava and more recently Potenza have been attempting to learn and develop appropriate strategy frameworks to learn from these experiences.

- The development of such policy frameworks and associated, costed delivery strategies is included in some national legislation. It is recommended that where this is not the case then action is taken either at national level to develop such legislation or that cities and city regions take the initiative and develop such plans.

It is clear that the starting point of the sites is crucial in determining what measures and approach to implementation are appropriate.

The starting point of the various sites was very different in terms of both current focus of sustainable transport and the direction of future development. Because of this it is necessary to establish a clear current status assessment and a coherent set of objectives at political, strategic and functional levels within which the developments are made. For the SMILE cities this might have been something on the lines of:

- Malmo - very strong on public transport and cycling and looking to build on these strengths and generate wider integration
- Norwich - good public transport and a flagship park and ride system, again looking to build on these strength and generate wider integration
- Tallinn – comprehensive, but low quality public transport network which formed the focus of the measures with a general public transport upgrade and additional focus on key corridors
- Suceava – building on previous focus to build a sustainable city centre, with a focus on an overhaul of the public transport service provision and regulation and extension of the low emission zone
- Potenza – existing city centre traffic restrictions, but poor local public transport and high car dependency requiring a public transport upgrade and a strong mobility management intervention

For both Tallinn and Suceava, which as cities representing the new member states were formerly members of the eastern economic bloc, a balance had to be struck between the pace and extent of liberalisation that is allowed and the degree of regulation that is required in order to ensure a sustainable outcome.

In both cases it would appear that the rate of change has been immense, linked to rapid economic changes. This can result in potentially severe transport and environmental problems, which a programme such as CIVITAS may only be able to mitigate rather than prevent, such is the strength and speed of the change and the size of the investment required. However this situation also represents an opportunity and both Tallinn and Suceava have shown strong desire and capability to address the issues as they have arisen and to put in place measures that should stand the city in good stead for the long term, rather than looking for short term solutions.

In both cases, also, a strong political control and regulation of the transport market still exist (for Suceava this was reviewed and extended within SMILE) in order to provide the necessary level of planning and control.

In addition to the variability in policy / action statuses, the degree of backing in terms of traffic and land use modelling capability, transport and environmental monitoring and planning / parking control varies considerably and the lower level of expertise and systems in Tallinn and Suceava has been identified as a key area for improvement.

- These aspects (traffic and land use modelling capability, transport and environmental monitoring and planning / parking control) need to be a focus for development for many cities in the new member states if the support systems that will allow the development of appropriate transport policy frameworks and strategies as recommended previously are to be in place.

Availability of Financial Means and Economic Logic

Provision of finance for innovative measures has been a key reason for the cities to participate in CIVITAS SMILE.

The core funding available to local authorities tends to be for mainstream activities and those which have already got central government or local policy approval. Depending on the internal rules in place this may make identification of co-funding sources, whether internal or external, difficult. This, in turn, makes it difficult for cities to progress experimental or promising initiatives without some form of funding to allow an element of controlled risk or experimentation.

CIVITAS has been important to keep pushing the boundaries of innovative measures in the cities, either speeding up implementation of new ideas, or allowing innovative measures to be tested that otherwise would not be tested. The key step pushing on from such demonstrations is to ensure that successful measures have a business plan in place so that the benefits can be exploited and brought into the mainstream. This requires long term planning, for example using the approach taken in the Norwich freight consolidation centre, where the measure was set up through the design and tendering stage to ensure the ongoing liability is shared with a private sector operator.

In order for measures to reach the mainstream a justification needs to be established from the evaluation of the measures. In most cases this will involve a favourable cost effectiveness or cost benefit calculation. However, circumstances may exist where the political benefit from a measure may require continuation or expansion of a measure, irrespective of this. Whether this can be achieved depends on the degree of flexibility in the subsequent funding regime to be used (e.g. local / national sources).

The degree to which externalities and cost savings can be factored into the financial calculations on which these decisions are based is crucial to the overall case. Within the evaluation we have identified several cases where a direct financial benefit accrues to the project partners as a result of the measure. We have also identified cases where there is either a direct financial benefit but the systems do not allow it to be isolated / quantified or where the benefit is accrued by an individual or organisation that is not the implementation organisation.. This raises a number of issues related to the balance of investment vs benefit in sustainable transport measures. Three particular instances that have been noted in SMILE are:

- Where the investment is made by a public sector organisation and there is a direct or indirect financial benefit to those citizens that participate

This seems entirely appropriate and such benefits are a successful way of marketing sustainable travel initiatives to the public and rewarding them for making positive societal choices.

- Where the investment is made by a public sector organisation and there is a direct or indirect financial benefit to a different public sector organisation

This type of situation has been shown to lead to problems in some cases, missed opportunities in others, as well as some successes. For example, the collaborative working between City of Malmo and Skanetrafiken on many of the public transport and mobility measures has been achieved by identifying the mutual benefit of investing in infrastructure, service improvement and marketing, with ticket revenue being the obvious financial outcome, which should permit further service improvements – leading to a virtuous circle.

A similar pattern has been seen in Suceava, where the introduction of a new regulatory regime for private minibuses has both generated a market opportunity for the public transport company, but also generated an additional income stream for the municipality which it has then been able to invest into new buses.

However, the situation is not always replicable – in Norwich it proved impossible to persuade the main hospital to provide sustainable travel advice for people attending outpatients appointments, even though the health sector would be a long term beneficiary of the improved health outcomes from a change to more active travel and has to a certain degree contributed to access problems by virtue of building a consolidated hospital cite at the edge of the city, which is less well linked to sustainable transport provision.

- Where the investment is made by a private sector organisation (either voluntarily or as a result of local legislation) and there is an environmental benefit for the wider population.

This has been raised by several organisations asking why as a private sector organisation they should pay the full investment cost when the benefits are felt primarily by society at large as represented by the local public authority. Where co-financing through programmes such as CIVITAS are in place then this complaint can be mitigated, though not necessarily removed, depending on the levels of grant / co-financing that are available.

- This highlights the need to find ways to work across sectors, both in terms of the public and private sectors and also within the public policy framework so that the full implications of decisions can be understood. For example, if the full transport and environmental impacts of a hospital or school relocation were included in the bottom line calculation would the outcome be the same?

We have noted that there are clear differences in the fiscal regimes that exist between the countries / cities, which have a clear influence on the way in which measures can be implemented and what can be pursued.

- For the results to be truly transferable between cities / countries such fiscal differences need to be minimised because there is not only a direct effect, but a much more fundamental effect in terms of technology development and availability which takes time to overcome, even when changes are made.

Creation of Institutional Cooperation and Stakeholder Involvement

Institutional co-operation has been a common and often necessary theme throughout the SMILE measures. In the vast majority of cases it would be impossible for a single organisation to implement a CIVITAS measure because of cost or knowledge requirements linked to its innovative nature. In some cases the number of collaborating organisations has approached double figures! The basis upon which this co-operation happens is crucial and having the appropriate structures in place appears to help the necessary collaborations to be set up and exploited. This is particularly the case where there is a specific public/sustainable transport agency and then a number of contracted operators in place whose responsibility it is to provide the specified services.

There are many examples from SMILE that could be quoted:

Suceava – municipality and local transport company who collaborated to provide new vehicles and routes; municipality and schools and businesses for both sustainable mobility promotion and new mobility management actions.

Malmo – city authority and regional transport authority for many public transport and mobility measures; city authority and private sector businesses for eco-driving, car sharing, biogas and measures aimed at goods transport in and around the city.

Norwich – collaboration between city and county councils as joint partners with interlinked statutory responsibilities; direct liaison between city/county council and bus operators; liaison with private sector freight transport operators; liaison with schools, University of East Anglia and other businesses for mobility management / travel planning.

Potenza - collaboration between city and regional authorities in relation to initial mobility management / travel planning; liaison with businesses and other main institutions about subsequent mobility management / travel planning.

Tallinn – where again there were three service operators (both publicly and privately owned) providing the public transport on behalf of the municipality under contract.

The previous points about institutional structures and the way in which grant support programmes function in individual countries are clearly important to understand the issues that need to be addressed to make such partnerships work. Also important are clear understandings of the objectives of both the individual organisations and the project to be undertaken in order to avoid uncertainty and conflict part way through project delivery.

Although organisations involved in delivering the measures are working together to meet a common set of objectives, there will often be a contractual arrangement between commissioning organisation (often in the public sector) and a supplier – usually in the private sector.

- The scope of the contract for large scale, technical tenders is often wide ranging and complex. In such situations there needs to be thorough scoping of the technical requirements. Contracting organisations should ensure they are properly prepared for the procedures that this will entail, and allow for this in their implementation timetables. They will also need to have an appropriate level of in-house knowledge (or seek to obtain such knowledge), to ensure the right technical specification in tenders and to judge potential subcontractors' expertise.

When developing partnerships between public and private sector organisations the issue of intellectual property right can be a particular issue that needs to be carefully addressed. Within SMILE one of the telematics measures in Norwich was severely hampered because of the terms of an agreement that had been set up prior to SMILE. This pre-existing agreement prevented access to what would have been expected to be public information for uses other than those initially conceived without the payment of further significant access charges. This necessitated extensive negotiations, delays and in the end use of an alternative approach to the task and is a lesson for those specifying such agreements in future not to overlook the future potential of IT systems.

- On a related note, IT system compatibility is a particular issue which also often causes problems and has been an issue from time to time in Malmö and Norwich as efforts have been made to use information form several sources and make it available in a consistent, user friendly way through a single portal. Where national and international standards can help with this type of issue, even if they are advisory rather than statutory they should be followed in order to avoid such compatibility issues.

One of the most important legacies of the SMILE project will be the different institutional culture in the cities, particularly Malmö and Norwich, where there has been a transformation in the way in which the softer elements of sustainable transport such as information measures and travel planning are viewed. This helps not only bring different teams within the same organisation together, but also leads to the cross-fertilisation of ideas.

Increase of User Participation and Awareness

The role of user participation and awareness is recognised both by the importance given to dissemination of the project at the local level, and also by the existence of workpackage 11 which includes a number of communication based measures designed to raise awareness of and change behaviour towards sustainable travel.

The approach to local dissemination has varied between sites with some using a range of local media such as radio, television and newspapers, whereas other sites (particularly Potenza and Suceava) have approached it more as a detailed consultation exercise. Both approaches appear valid, as they were chosen to match the available facilities and user needs.

Without user awareness and participation the innovative measures are effectively pointless. It has long been recognised that even major infrastructure projects can be enhanced in terms of effectiveness through an associated introductory information campaign. The importance of such communications increases by a disproportionately large amount for many of the measures within CIVITAS which are effectively support measures to enhance existing infrastructure in one form or another.

The role of measures such as travel planning has been shown to have induced a major change in institutional perceptions in both Malmö and Norwich. This is not least due to the huge success of these measures, particularly in Norwich. This is shown by the contrast between the situation before SMILE when it was “incredibly difficult” to get transport engineers to engage with soft measures such as travel planning, to the end of SMILE when other staff involved in working groups and also coming to travel planning professionals for advice and colleagues in Development Control have been heard talking in the office about cycling routes as if they are serious about getting people out of cars. This will undoubtedly feed through to other policy measures and leave as a project legacy a different approach to these issues.

The potential for well-designed and targeted communication actions is easily demonstrated by two examples:

The first is from Malmö, where the Skånetrafiken campaign “Skånetrafiken for you” established a work-based targeted initiative had a very strong immediate impact and also a substantial lasting impact on travel behaviour for participating employees at a number of organisations. The key to this was to establish clearly the needs to the potential public transport users, make a clear offer of incentives to switch to use of public transport and in parallel with this develop a long lasting relationship between Skånetrafiken and their new customers.

The second example is from Norwich, where the County Council’s sustainable transport team established a new collaboration with, amongst other organisations, a group of independent schools in the city centre. The independent schools tend to have a much larger travel to school distance than normal, with many children travelling in from outlying villages. This opened the opportunity to exploit the existing Park and Ride network, and with the introduction of a new ticket structure, a significant modal shift was achieved for the final leg of the journey to school i.e. within the urban area.

- These measures emphasise the need to properly research user needs – a stage that is often omitted due to budget restrictions or eagerness to follow a proposed idea – before attempting to run an awareness / behavioural change campaign, so that it can identify the individual motivating factors and so maximise success.

This approach is taken to its logical extension in the application of personalised travel planning, which has also been applied in Norwich in the area around the University of East Anglia.

Technical Recommendations

The disappointing results from the freight measures highlight a particular issue that needs to be considered. CIVITAS and other projects often try to isolate measures within the city context, and there is often talk of urban freight initiatives and city freight schemes. However, this ignores the fact that the current economic system means that freight transport needs to be considered at a level that is broader than the individual urban level. Decisions that govern the movement of freight in our cities are often taken in locations far from that city, possibly in other countries. Similarly the vehicles that conduct the transport are often based at depots far from the urban area where land and labour is cheaper. This existing framework cannot be ignored even for urban freight consolidation schemes, which would introduce a break in the chain at the urban boundary, because that break in the chain cannot be a discontinuity that affects the economic effectiveness of the distribution operation.

The evaluation of individual measures has shown that there is scope with existing clean vehicle and fuel technologies to reduce emissions of both locally harmful pollutants, but also life-cycle CO_2 emissions if biofuels from sustainable sources are used, particularly those like biogas that are produced from waste. However, the indication is also that the combination of soft measures to modify travel choices and overall travel demand together with strong policy steers at all levels (such as low emission zones, further tightening of vehicle CO_2 standards, fiscal incentives to more fuel efficient and less polluting vehicles etc) will be needed as a package in order to meet our future environmental goals. In some parts there is a temptation to rely solely on a technical fix over the next 40 years, based on the assumption that the energy supply can be decarbonised. Whilst this might be the case, there is an inherent risk in relying on technologies that are not yet close to being developed. In the meantime there is an opportunity to start making the necessary changes to personal mobility behaviour, attitudes and expectations that will in all probability be needed anyway as part of any package for a sustainable future.

Transferability of measures is not guaranteed in exactly the same format because of variations in cultural, social and economic situations and contexts. For this reason it is important that adequate time, effort and resources are allowed for full research, motivational assessment and testing for many of the measures that are constituent parts of the SMILE project. Such steps should be inherent for many of the measures, particularly those that rely upon a change of behaviour by either an individual or an institution / company.

From a technical perspective two measures appear not to have worked as planned – measure 12.2 which involved the installation of a traffic monitoring and signal optimisation system and measure 10.1 – the freight driver support system – which was scaled back from a demonstration to a technical development project because of problems with the dynamic planning and scheduling element of the system. Both these measures appear to have potential to deliver positive benefits in their areas of application and so would be worthy of further, well monitored technical development. (Although measure 12.2 might be expected to be mature technology by now unless a particularly innovative algorithm is at the route of the problem.)

Two other measures that have not performed as well as might have been expected are measure 11.5 (individual travel planning) which did not produce the level of behavioural change observed in other similar projects and 10.5 the freight consolidation centre, which needed increased profile and regulation of the local access for freight vehicles to drive uptake.

1 Introduction

This document is the Final Evaluation Report of the CIVITAS SMILE project. The objective of this report is to provide a clear explanation of the approach taken in the evaluation of the CIVITAS SMILE project and a detailed presentation and analysis of the project results of the measures implemented in CIVITAS SMILE, in the context of the overall framework provided by the GUARD project for the whole of the CIVITAS II programme. The rest of this section provides an introduction to the CIVITAS II programme and more specifically the CIVITAS SMILE project, and outlines in more detail the rest of this report.

1.1 Background

CIVITAS - cleaner and better transport in cities - stands for CIty–VITAlity–Sustainability. With the CIVITAS Initiative, the EC aims to generate a decisive breakthrough by supporting and evaluating the implementation of ambitious integrated sustainable urban transport strategies that should make a real difference for the welfare of the European citizen.

The objectives of CIVITAS are:

- to promote and implement sustainable, clean and (energy) efficient urban transport measures
- to implement integrated packages of technology and policy measures in the field of energy and transport in 8 categories of measures
- to build up critical mass and markets for innovation

CIVITAS I started in early 2002 (within the 5th Framework Research Programme); CIVITAS II started in early 2005 (within the 6th Framework Research Programme).

Within CIVITAS I (2002-2006) there were 19 cities clustered in 4 demonstration projects, whilst within CIVITAS II (2005-2009) 17 cities are taking part in 4 demonstration projects. These 36 cities all over Europe are funded by the EU to the value of 100 M € and the overall budget of the Initiative will be more than 300 M €.

The future of CIVITAS is now assured with 4 (or is it 5) new projects progressing as part of a new programme entitled CIVITAS+, which will run from 2008 to 2012.

In both CIVITAS I and CIVITAS II a horizontal project supports the CIVITAS demonstration projects & cities by:

- Cross-site evaluation and Europe-wide dissemination in co-operation with the demonstration projects
- The organisation of the annual meeting of CIVITAS Forum members
- Providing the Secretariat for the Policy Advisory Committee (PAC)
- Development of policy recommendations for a long-term multiplier effect of CIVITAS

The key elements of CIVITAS are that:

- CIVITAS is co-ordinated by cities: it is a programme “of cities for cities”
- Cities are in the heart of local public private partnerships
- Political commitment is a basic requirement
- Cities are living ‘Laboratories’ for learning and evaluating

1.2 The CIVITAS SMILE Project Consortium and Cities

SMILE (Towards Sustainable Mobility for People in Urban Areas) was one of the four CIVITAS II projects. SMILE was a four year European project that involved a total of 32 partners during the course of its life[2]. The project involved the implementation of 51 demonstration measures.

The overall project strategy, linked to that of the overall CIVITAS II programme, was to combine a set of measures to develop an intelligent, sustainable and intermodal urban transport solution that makes it possible to live an active life independently of use and ownership of private cars. The individual measures are outlined in section 1.4. They are presented in eight workpackages according to the topic area headings of the CIVITAS II programme.

Evaluation has formed a key part of SMILE. The participants have worked together closely within an overall evaluation framework to conduct a thorough and structured evaluation. Extensive exploitation and dissemination activities have then picked up on the implementation and results of the measures in order to maximise the value of SMILE. SMILE developed and implemented an advanced training model to exchange know-how between the cities.

As shown later in this report, the results have wide transferability in Europe, with particular focus on the cities of the new member states. SMILE demonstrated how small and medium sized European cities can make progress towards reaching EU-objectives and the goals of the Kyoto treaty through an intelligent, sustainable urban transport solution based on intermodality between transport modes.

1.2.1 The CIVITAS SMILE Cities

The project was structured around two leading cities, Malmö (Sweden) and Norwich (UK) with three follower sites, Tallinn (Estonia), Suceava (Romania) and Potenza (Italy). The CIVITAS SMILE cities typify the urban policy issues facing the many historic medium sized cities in the European Union and in Accession Countries, providing a significant potential for transferability of results.

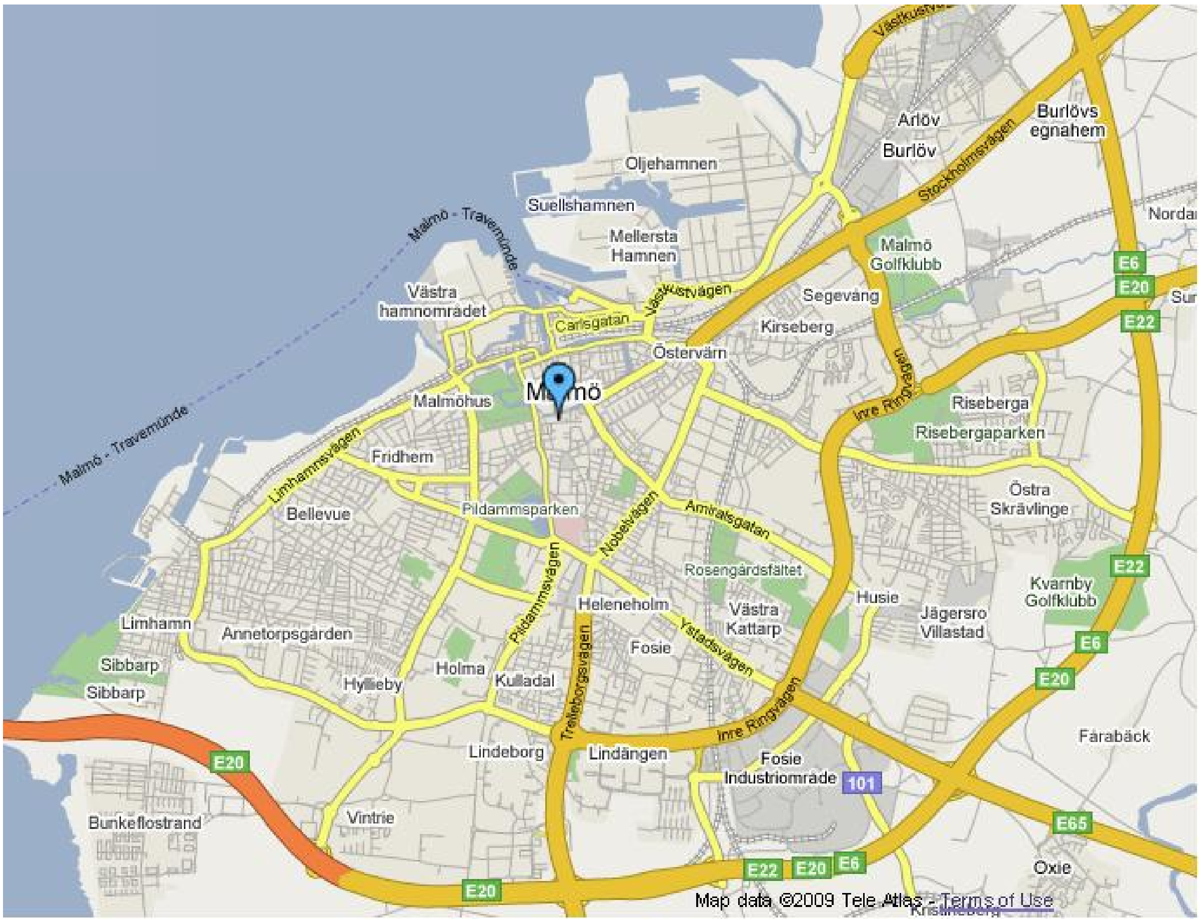
Malmo

Malmö is Sweden’s third largest city with a population of 265 000 that developed as a thriving industrial and trade centre from its mediaeval roots. In the early 1990s, however, Malmö was a city in crisis and dramatic change with the collapse of the industrial economic base in the city, mass unemployment and a huge influx of refugees largely from upheaval and war in Eastern Europe and the Balkans. The last decade has seen Malmö consciously reinventing itself as a sustainable multi-cultural European city of the future with major developments such as the opening of Malmö University, the

[2] During the course of the project three partners withdrew and three partners joined the consortium for various reasons.

construction of the Öresund Bridge to Copenhagen, urban renewal and attractive new housing and commercial areas. Malmö has had a strong focus on creating a green, attractive and environmentally aware city, and has gained national and international credit such as the EU's Campaign for Take-Off Grand Prize in 2000.

Spatially, Malmö is a brick city that in a succession of concentric rings has reached out into the surrounding plains. The inner city is characterised by turn of the century brick and stone buildings. The peripheral environmental programmed areas enclose the inner-city and new robust city districts emerge beyond this. The city map in Figure 1.1 further illustrates this description of Malmö. Malmö's districts show clear identities and the city presents a variety of social cultures. Overall development in the city has taken place gradually in concentric rings and in connection with the Öresund fixed link, connecting road and rail networks.



Source: http://www.maplandia.com

Figure 1.1 Malmo

A major environmental adaptation of the city's transport infrastructure is currently under development based around the construction of an underground/over ground rail system linking into the transport infrastructure of both Malmö and Copenhagen. This major change in the transport infrastructure of the city will be a major turning point in communications in the city, completing the transport integration of the Malmö-Copenhagen metropolis and forming a focus for a reprioritizing of communications to tackle rising private car use. Early successes with clean and renewable fuels in the bus and city vehicle fleet, car-sharing, rational distribution, cycling and pedestrians will be built on in a long-term strategy to create a human-scale integrated sustainable transport system central to the sustainable city.

Since the early 1980s emissions of fossil carbon dioxide have decreased by 46% or the equivalent of 10.4 tonnes per capita in 1980 to 5.2 tonnes per capita in 2000 (in a period when the population of the city has increased by 13%). This is much due to the transformation in the industrial sector and more sustainable ways of producing district heating. The City of Malmö aims to decrease CO_2 emissions by 25% from 1990 levels by 2010 and to phase out fossil fuels entirely over time. Changes within the transport sector are essential in order to reach these ambitious goals.

Two new policy documents guiding the transformation of the transport system in Malmö are the Strategic Traffic Plan (STP) and the Traffic Environmental Programme 2005-2010 (TEP). The Strategic Traffic Plan is the overall guiding document for the development of the transport system in Malmö. It's main objective is to provide for the mobility needs and vitality of the city while minimising the negative environmental effects of traffic.

The Traffic Environmental Programme 2005-2010 builds on an earlier TEP from 1997 and has been produced in co-operation with all central actors in Malmö with surroundings. The objectives of the TEP 2005-2010 is to lead to a cleaner, quieter, healthier and more efficient traffic system. TEP 2005-2010 states clear goals for the next four years within six areas:

- The pedestrian environment
- Cycle traffic
- Public transport
- Freight transport
- Car traffic
- Transport planning

Norwich

The City of Norwich, situated in the east of England is the administrative centre of the County of Norfolk. It covers some 50 square kilometres with a population of about 120,000, although this increases to 250,000 if the immediately adjacent built up area lying outside the city boundary is taken into account.

Although the administrative area of Norwich is geographically small, the role of the city is much larger as a regional centre with an extensive catchment covering most of Norfolk and parts of the adjacent County of Suffolk. Whilst the city itself is relatively compact, it is built on a radial pattern, and with a relatively large but low-density catchment; movement patterns are essentially disparate. Reliance on car-based travel, particularly beyond the urban area is very high.

Norwich city centre is highly accessible by non-car modes of transport. Public transport services within the Norwich Area focus on the city centre, and whilst orbital journeys within the urban area by public transport are not catered for, except via the city centre, a significant proportion of the urban population already has access to a 20-minute (or better) service. Park and Ride services increasingly provide for long stay car parking beyond the urban edge, reducing the need for car travel within the urban area. Rail services are available on lines to Cambridge and the Midlands via Ely, Great Yarmouth, Lowestoft, Sheringham and London Liverpool Street.

High density residential development within the outer ring road, and the city centre itself results in high levels of pedestrian access (18% of shoppers walk to the city centre[3]), whilst the relatively flat terrain and the compact nature of the city offers the potential for high levels of cycle use. However, the city suffers from traffic congestion and major routes create severance. The level of traffic creates air quality and noise problems in some locations and can be intrusive in some residential streets. Access by non-car modes to some more peripheral parts of the city is difficult.

[3] MAP Research September 1999

Transport and traffic management are probably the most difficult and challenging issues facing the city. Norwich's economic prosperity depends upon large numbers of people from the surrounding areas being able to get into the city centre for work, for shopping and for leisure or tourist visits. The city has one of the highest numbers of commuters travelling into the city in the UK. The preferred form of transport for such journeys for most people would currently be the car. However, the city's compact urban form, its medieval street pattern, the retailing success of the pedestrianised retail area, the need to protect residents from traffic intrusion, congestion and pollution, together with national transport policies, mean that alternative forms of transport need to be made at least as attractive as the car for many journeys. Norwich's compact form provides considerable scope for this 'modal shift' towards sustainable forms of transport to be possible.

Norfolk County Council, in association with Norwich City Council, transport providers, local business and local communities has been working to improve accessibility for everyone around the city, as well as wider accessibility to Norfolk, the rest of the UK and Europe.

Transport is a major user of finite resources, particularly land and fossil fuels. Within a relatively dense urban area like Norwich, the impact of inefficient use of these precious resources is a negative one. Improvements in technology in recent years have meant that there has been a real reduction in some atmospheric pollutants, but carbon dioxide (CO_2) (which is the major greenhouse gas), levels of noise and the amount of land used for the movement and parking of vehicles continue to rise.

If current trends continue, traffic levels in Norwich will increase by around 30% by 2016. The impact of this on the quality of life and the economy of the city would be significant. However, past rates of change do not limit what is achievable, because they reflect a time when the issue of greenhouse gases was not recognised. The changes in lifestyle resulting from more efficient and sustainable use of transport will have social benefits too, enabling the 30% of households without access to a car to enjoy much greater opportunity to access social, cultural and employment opportunities.

Recent consultation on the City Centre Transport Plan (CCTP) threw up a wide range of matters relating to transport. The main issues raised in the consultation were:

- Various concerns and solutions to the problem of bus interchange (a CCTP issue);
- Desire to accommodate car trips to the city centre so far as possible for the benefit of business (a CCTP issue);
- Attention should be given to the needs of pedestrians as a matter of priority;
- Concern about the pace of change in traffic planning, in terms of the effects on congestion, assumptions about diversion of trips, publicity for changes, and enforcement capability (CCTP issues in the main);
- Cheap and reliable public transport is essential to provision of accessibility for development;
- Support for safer residential environments throughout the City with Home Zones, speed restrictions and other traffic management measures;
- Parking standards should be set as maximum levels and reduced for main accessible areas;
- Need for a high quality cycle network for the city, which is safe and attractive for more cyclists.

The Norwich Area Transportation Strategy is a joint strategy led by Norfolk County Council with Norwich City Council in discussion with Broadland and South Norfolk District Councils. The strategy was adopted in 2004 providing the framework for transportation investment in the City.

The overall strategy links to Government guidance and the draft Regional Spatial Strategy. It:

- Recognises the Norwich area as a centre where growth will be focussed. (Likely growth includes a major urban extension to the north east of Norwich and growth of Norwich International Airport.) The strategy looks to provide the essential infrastructure needed to accommodate this growth.
- Supports the Norwich area as a sustainable community, complementing development by measures to provide a high quality urban experience. It includes policies to reduce the impact of traffic, extend the pedestrian dominance of the city centre (identifying that ultimately through traffic can be stopped, in conjunction with an Northern Distributor Road), reduce traffic impact on residential side-streets and roads around the north of Norwich, make the best use of the road network and ensure that transport schemes meet their desired outcomes using high quality design.
- Supports Norwich's role as a Regional Interchange Centre: strengthening the role of interchange, improving bus travel in the urban area, improving links to other urban areas and improving interchange within Norwich between modes.
- Promotes travel choice: enabling people to make personal choices of travel mode.

The strategy has already achieved some notable successes. Within the Norwich City Council area, between 1991 and 2001 the percentage of people normally travelling to work on foot increased from 20% to 23%, whilst the proportion travelling by car or van remained more or less unchanged. Traffic flows crossing the inner and outer ring road cordons in Norwich have remained also more or less unchanged between 1995 and 2002 and whilst traffic speeds have reduced in the evening peak hour, they have increased in the morning peak hour between 1989 and 2001.

The Local Transport Plan details transportation improvements that are proposed by the County and City Councils together with a programme of implementation. Whilst much of the programme involves improvements to existing infrastructure, new development will present additional opportunities to provide new links to help to improve the pedestrian and cycling environments, public transport, and provide opportunities for new occupiers to take advantage of the more sustainable modes of transport.

Tallinn

The City of Tallinn is the capital of Estonia and the centre of culture, economy and higher education in the country. With its 380000 inhabitants Tallinn is also the largest city in Estonia. Since the independence of Estonia in 1991, Tallinn has experienced significant changes. Initially an economic downturn and then the rapid economic growth have imposed large structural changes on the city and it's transport system. The number of private cars has been growing rapidly and the collective transport network has not developed in the same pace as the private modes, facing huge competition. Between 1990 and 2000 public transport use fell from 250 to 94 million trips per annum and the modal share of the public transport in Tallinn collapsed from 77% to 31%.

The worsening quality of public transport has affected virtually everybody in the city, but most of all women, children and elderly people who are most dependent on it. The massive shift to private car use has worsened the city environment dramatically. Further the old part of the city has been graded as a UNESCO world heritage site and change appears urgent to prevent it from being damaged by traffic.

The existing public transport networks (bus, trolleys, tramways and suburban trains) need to be renewed and extended so as to support sustainable urban development. In this framework the EBRD financed a study to establish a strategy for the public urban transports development and an investment program for the 2004-2010 periods. A feasibility study for optimizing the collective transport network is carried out during years 2003-2004.

The City of Tallinn is responsible for planning of the route network, planning of the service level, co-ordination of time schedules, ordering of services and providing information to passengers. The transport services are currently procured from two city owned companies (TAK and TTTK) and one private bus company (MRP).

The Tallinn City Council has approved the "Sustainable Development Plan for the Public Transport" and is actively promoting better public transports along this plan. New initiatives include among other things:

- Implementing a new ticketing system based on an identity card (implemented in 2004)
- Introducing new timetable software in order to co-ordinate the timetables of the three operators, TTTK, TAK and MRP.
- Renovating a number of old trams, the electric motors are being changed to energy-efficient models that produce electricity during braking.
- Modifying a number of trams with new low-entry central parts in order to increase accessibility.

Potenza

Potenza, situated in the southern part of Italy, is the chief town of the Province and of the Basilicata region. The study area (the area where the impacts of the measures may be felt) covers a population of up to 110000 if surrounding districts are included. The project area (the area where the measures are implemented) is represented by the historical centre of Potenza, situated 820 metres above sea level on a mountain range adjacent to the Basento River and the immediate surroundings.

Historical Background

The origin of Potenza dates to the 4th century BC, when people coming from the north-east decided to settle along the Basento River. During the Roman Empire, it became an important prefecture, with the name of Potentia and through the 5th to the 12th centuries it was an Episcopal seat.

A terrible earthquake in 1273 shook the town and let the inhabitants to move higher up the hill to a point at 820 metres above sea level. The move resulted in socio-economic isolation persisting during the medieval age that prevented important changes or renovations in the urban configuration and left the town centre unchanged, within its closed walls, for a long time. Only in the 1920's did Potenza grow outside its walled perimeter, expanding on the lower part of the territory, into the Basento valley.

In 1959 the Industrial Consortium of Potenza, formed by public organisations, local authorities, financial institutions and big industrial firms, gave birth to a number of different activities within the provincial territory. The town's expansion increased during the following years, until a serious earthquake of 1980. After about twenty years of reconstruction, Potenza is currently facing a huge process of renovation, increasing its commercial activities, particularly redeveloping industrial activity in the sectors of food, metals, electronics, shoes, clothing and plastic materials.

Transport System

Potenza's transport system still has some deficiencies which contribute to lower the quality of life in its ancient centre, with negative effects not only for residents but also in terms of attracting tourists.

There is currently one pedestrian road in the historical centre, Via Pretoria, which borders the first section of a pedestrian support system which has just been finished. The pedestrian system is based around a series of escalators that link Piazza Vittorio Emanuele II, situated on the edge of the town, with the town centre at the top of the hill. This system spans a difference in height of about 150 metres and greatly increases the ease of pedestrian trips into the town centre (see figure 1.2).

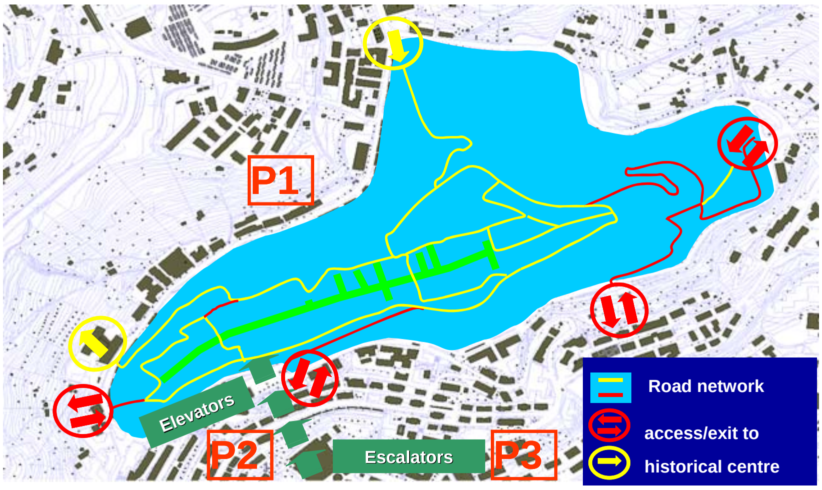


Figure 1.2 Potenza: mobility system within the ancient centre

The town's central road network cannot adequately manage both vehicle and pedestrian traffic due to low widths and absence of footways. Traffic volumes are always high in the centre and roads are congested. Concerning the current parking layout, in the whole area there is a critical ratio between parking demand and supply, with double parking and car parking in "no parking" areas occurring everywhere.

Within the CATCH project framework (LIFE02 ENV/UK/000136), Potenza has already started a sustainable mobility development process leading in the next years to:

- The introduction of a Limited Traffic Zone in the historical centre of Potenza with a consequent reconfiguration of traffic rules and parking layout;
- The realisation of a feasibility study for the application of new infomobility technologies supporting the new integrated transport system in Potenza;
- The installation of technological bus shelters and Variable message Signs (VMS) in some crucial points of the historical centre.

Suceava

Suceava is in the north east of Romania, 450 km from Bucharest, and has been the capital of Suceava County since 1388. The municipality of Suceava, covering an area of 52 km^2, lies on the banks of the Suceava river, in an upland area situated at an altitude of 400m from sea level. The town and suburban areas have 118500 inhabitants. The historical town centre of Suceava includes many monuments and orthodox churches and the area is declared an UNESCO world heritage site.

Since 1999, the northern part of the country, where Suceava is situated, has been involved in a government regeneration scheme to boost the local economy and promote foreign investment.

One important condition of this regeneration is the improvement of the condition of the transport network. Suceava is located at an important road junction, crossed by two European roads (the European corridor 9 of TINA network is situated in the vicinity of the city), five national roads and four county roads.

The Local Council and the Municipality of Suceava city are developing a local plan to modernise the local transport and traffic system to create a solid base for local economical development. The vision of this Plan is "to develop a fully integrated and sustainable transport network for Suceava, which supports economic, social and environmental regeneration and ensures good access for all in the community".

Suceava began implementing clean vehicles and quality public transport services in the ALTER*eco* Project in 2000. The municipality owns the local transport company, which provides the public transport in the city. The municipality of Suceava has formed partnerships with Merseytravel and CTP in two projects (ALTER*eco* and CATCH) concerning measures to reduce the impact of traffic and improve public transport.

1.3 The SMILE Project Objectives

The objectives set for the CIVITAS programme, the overall SMILE project and the individual measures are what drive the evaluation process within the project. The objectives have different characteristics depending on their nature, as follows:

- Strategic objectives
- Project-related objectives and targets
  - Process
  - Output
  - Outcome
  - Exploitation

Strategic Objectives

The overall aim of SMILE was to demonstrate and evaluate a modern and integrated transport system in which the borders between the different modes of transport are gradually erased so that the traveller is free to combine different modes of transport which are both clean and integrated.

The project aimed to achieve this by:

- combining new ways of planning, exploring and adapting incentive structures, changing attitudes and creating flexible transport solutions
- ensuring that sustainability, the health and wellbeing of citizens and the protection of cultural heritage grow at the same pace as economic development, whilst reducing the interdependence of economic growth on the growth of car use and traffic
- creating a more equal transport system, where all travellers have the same opportunities irrespective of their mode of transport or social characteristics, (age, gender, social status or disability)

These goals were in line with the wider objectives of the CIVITAS programme and the European Commission's 6th Framework programme, including:

- Development of the European Research Area concept
- Exploiting the new clean urban transport economy – in line with the aims of DG Enterprise
- Applying Kyoto principles for reducing climate change – in line with the aims of DG Environment
- Promoting the EC agenda on urban sustainability – in line with the aims of DG TREN and DG Environment
- Combating social exclusion in Europe – in line with DG EMPL aims and its 5 year programme
- Contributing to the equal gender initiative of the Commission

- Contributing to the successful transition of the Accession Countries
- Contributing to the CIVITAS GUARD project and its broader assessment of the European situation, using all demonstrators
- To wider international programmes such as climate change, the WHO charter on transport and health, United Nations initiatives on gender equality etc.

Although relevant to determining the overall scope of the evaluation, the strategic objectives did not on their own determine the detailed definition of the evaluation process.

Project Objectives

The SMILE strategic objectives were achieved by implementing 51 measures in five cities in a complex and integrated project centred on several linked actions:

- Improved urban air quality through a combination of measures that will directly lower the hazardous emissions from city traffic
- The creation of a sustainable, safe and flexible traffic system that improves the quality of life
- Reversal of the current trend of increased use and ownership of cars, promoting sustainable alternatives and a long term stimulation of a modal shift towards public transport, cycling and car-sharing.
- Stimulation of efficient and clean city distribution of goods.

Hence there is a wide range of detailed objectives that have been set in order to help drive the implementation process. These operational objectives were set at both the project and measure level and could be allocated to the following four categories:

Process objectives related to activities which ensured the delivery of the project and its measures by defining the way in which things were conducted. At the project level they tended to relate to management procedures, whilst at the measure level they related to the way in which implementation was to be planned and realised. This latter issue was of particular relevance to the process evaluation of the measures which was conducted at the measure and programme levels.

Output objectives were expressed in terms of the successful delivery of particular measures judged in terms of degree and timing of the implementation. Degree of implementation could be expressed in terms of number and completeness of the measure against the original plans (e.g. implementation of a 50% biodiesel blend in 40 urban buses in a city compared to an original objective of pure biodiesel in 60 buses). The way it was expressed varied from measure to measure depending on the way in which the implementation target was expressed. As a general observation, although often used as a measure of a project’s success, this is simplistic because it takes no account of the effectiveness of what is implemented in comparison to what was anticipated and so should only really be used as a project management tool.

Outcome objectives are the most relevant way of understanding the true degree of technical success of a demonstration project such as SMILE. The outcome objectives should be expressed at both measure and city level and this was the main focus of the technical evaluation undertaken in SMILE, as manifested through the development and use of the framework of common indicators. This allowed for the impact of both the scale and effectiveness of the demonstrations as well as providing a basis against which the modelling of cumulative effects can be pursued.

Exploitation objectives were by definition related to the period after the implementation process. The exploitation process was dependent upon clear reporting of the project results so that it could be based on a true picture of what was (and what was not) transferable to other sites, cities and institutional / cultural frameworks. Because much of the physical exploitation of the project in terms of resulting implementation of measures would be after the end of the SMILE contract the exploitation objectives are largely expressed in ‘process’ and ‘outcome’ terms.

The following is a summary of the project level objectives relevant to the evaluation of SMILE. Process objectives related to the other management workpackages have not been included in this list and measure-level objectives have been listed separately elsewhere in the evaluation plan where their relevance to the detailed evaluation process can be seen more clearly.

Project-level Evaluation Process Objectives

- Co-ordinate and manage project evaluation activities at all levels of the project within time and budget restraints through an efficient planning and monitoring process
- Ensure efficient liaison on evaluation issues with GUARD, the SMILE project office and management board and the demonstration sites
- Assess and transfer the impacts of the demonstrations through the efficient output from the evaluation workpackage to workpackage 4 (dissemination, exploitation and training).
- Establish the effectiveness of SMILE measures in terms of:
  - the direct impacts of the individual measures
  - the indirect impacts of groups of measures where appropriate
  - the potential future direct and indirect impacts of the individual measures:
  - the potential cumulative impacts of rolling out the measures to the city scale

Project-level Output Objectives

A number of quantitative output objectives have been set at the project level, based on accumulation of the expected measure level outputs. These are:

- stimulate a combination of biofuels, especially biodiesel and biogas, and clean and efficient vehicles focusing on both cars and heavy vehicles (250 clean vehicles, 10 heavy gas vehicles, 71 LPG vehicles)
- demonstrate a range of biodiesel blends from 5 to 100% in public vehicles (totally 195 vehicles)
- improve biogas accessibility by upgrading biogas facilities and opening new gas filling stations (13.3 GWh/year)
- introduce (and extend existing) low emission zones and environmental zones in three city centres to promote clean vehicles
- demonstrate subsidised parking for clean vehicles
- implement public transport routing systems, improved interchanges between public transport/cycling, integration of rail and bus traffic and improved information and ticket vending
- stimulate car-sharing (totally 7 car-sharing sites and 25 cars) and car-pooling for private persons and companies
- implement satellite based city goods distribution management and logistic solutions such as urban transhipment centre, as well as goods deliveries to Park & Ride sites

- develop sustainable travel behaviours through implementing large scale mobility management and educational schemes directed to citizens, companies and the municipal organisation, (e.g. training in eco-driving in municipalities and companies, travel planning aid, mobility centres and home-to-work mobility plans), while also increasing social inclusion
- demonstrate new techniques such as real-time traveller information, traffic monitoring, mobile internet services for bus information and public transport priority systems

Project-level Outcome Objectives

- reduced emissions from vehicles
- improved air quality (not quantified in terms of location or impact)
- increase the proportion of SMILE cities covered by low emission zones
- improve the efficiency of city distribution services
- improve service quality, reliability, safety and security of public transport and wider transport system
- improved information provision
- shift the balance of fuel use away from conventional fossil fuels
- induce a modal shift from car to more sustainable passenger transport modes
- increase public awareness of the implemented measures and the environmental impacts of their transport choices

Project-level Exploitation Objectives

Exploitation objectives are the responsibility of workpackage 4 (dissemination, exploitation and training), but will be supported by the evaluation process objectives of:

- Assess and transfer the impacts of the demonstrations through the efficient output of relevant information from the evaluation workpackage to workpackage 4 throughout the course of the project
- Establish the effectiveness of SMILE measures in terms of:
  - the potential future direct and indirect impacts of the individual measures:
  - the potential cumulative impacts of rolling out the measures to the city scale

1.4 Overview of the SMILE Measures

The individual measures that were implemented within SMILE were grouped under eight topic area headings that are common to all four CIVITAS 2 projects, as shown in Table 1.1.

Table 1.1: SMILE Measures

CIVITAS 2 area	Measures	Site
Energy-efficient, cost-	5.1 Clean municipal fleet	Malmö
	5.2 Biogas on the net	Malmö

CIVITAS 2 area	Measures	Site
effective and clean vehicle fleets and the necessary energy infrastructure.	5.3 Clean heavy vehicles with CO_2 cooler	Malmö
	5.4 Alternative fuel vehicle fleets	Norwich
	5.5 Introduce clean vehicles in a large fleet of urban buses	Potenza
	5.6 Alternative fuel bus fleet	Suceava
	5.7 Promotion of alternative fuels in the public and private sector	Suceava
	5.8 Environmentally adopted cars (*new measure*)	Malmö
Demand management strategies based upon access restrictions	6.1 Extended environmental zone for heavy vehicle and enforcement	Malmö
	6.2 Introduction of a Low Emission Zone (LEZ)	Norwich
	6.3 Introduction of time controlled access restrictions	Norwich
	6.4 Extension of low emission zone	Suceava
Demand management and revenue raising strategies based upon integrated pricing strategies	7.1 Marketing of clean vehicles by subsidised parking	Malmö
	7.2 Influencing the choice of vehicle towards smaller and more fuel efficient vehicles	Norwich
Stimulation of collective passenger transport and its quality of service.	8.1 Marketing of new bus route system	Malmö
	8.2 Improved security and safety on buses	Malmö
	8.3 Integration of cycling with public transport	Malmö
	8.4 Rail station interchange	Norwich
	8.5 On street ticket vending machines	Norwich
	8.6 Linking individual passenger transport information with healthcare appointments	Norwich
	8.7 Demand Responsive Transport System	Potenza
	8.8 Bus priority measures and other bus improvements	Suceava
	8.9 Improved Public Transport Information	Suceava
New forms of vehicle use and/or ownership and lifestyle.	9.1 Car sharing for business and private persons	Malmö
	9.2 Development of a car sharing club	Norwich
	9.3 Development of a car pooling	Potenza
New concepts for the distribution of goods.	10.1 Freight Driver Support (*new measure*)	Malmö
	10.2 Satellite based traffic management for SMEs	Malmö
	10.3 Development of Strategic Freight Holders Club to Deliver Improved Efficiency of Freight Operation in the City Area and Effect Improved Air Quality in Urban Areas	Norwich
	10.4 Priority access for clean goods vehicles	Norwich
	10.5 Urban transhipment centre	Norwich
	10.6 Goods delivery to Park & Ride Sites	Norwich
	10.7 Sustainable SME logistic for the food industry (*new measure*)	Malmö
Innovative 'soft' measures for managing mobility demand.	11.1 Managing mobility needs of private persons and business sector	Malmö
	11.2 Eco-driving for municipal employees	Malmö
	11.3 Travel Planning	Norwich
	11.4 Car-pooling	Norwich
	11.5 Individual travel advice	Norwich
	11.6 Mobility centre[4]	Potenza

[4] This measure has been redefined to cover 4 topics that were originally separate in the project proposal.

CIVITAS 2 area	Measures	Site
	11.7 Information and awareness[5]	Suceava
	11.8 Eco-driving for hospital employees (*new measure*)	Malmö
	11.9 Heavy eco-driving (*new measure*)	Malmö
Telematics	12.1 Use of real time applications for traveller services	Malmö
	12.2 Traffic monitoring	Malmö
	12.3 Mobile internet services in connection to bus information	Malmö
	12.4 Internet tool for traffic planning	Malmö
	12.5 Public transport priority system	Tallinn
	12.6 Automatic stop calls and information-signs in public transport vehicles[6]	Tallinn
	12.7 Bus priority system	Malmö
	12.8 Customised traffic and travel information service for freight operators	Norwich
	12.9 Provision of real time passenger information	Norwich

Note: some of the measures (marked as '*new measure*' in the above table) were introduced during the project inception phase. As such their evaluation was not envisaged from the start of the project or included in the original version of the Evaluation Plan. As a result the provision of baseline data for these measures may have been delayed in comparison to some of the other measures.

1.5 Structure of this Report

Section two provides the context for evaluation within CIVITAS as a whole, the relationship with GUARD and the detail of how this was translated into the actual evaluation of CIVITAS SMILE through the framework for the CIVITAS SMILE evaluation, initially as an overview of evaluation activities at the site and then more details for each measure to be implemented at the site in question, as previously detailed in the project's Evaluation Plan.

Section three contains the majority of the detail of the evaluation at the measure level within the SMILE demonstration sites, as taken from the individual measure evaluation templates that constitute the annexes of this report.

Section four uses information from the cumulative effects assessment to explain how the measures implemented have fitted in with the wider policy context in each of the CIVITAS SMILE cities, how this has influenced the shape of the measures and any subsequent impact on the results.

Section five provides further analysis with a view to extracting broader messages, patterns and key findings from the measure results in terms of cost effectiveness, transferability and in the implementation process.

Section six pulls together the key conclusions and recommendations from the rest of the report into a single location.

The annexes present more detailed information about evaluation results at the measure level in the form of evaluation templates – a standardised way of presenting the evaluation data common to all the CIVITAS projects, which form the building blocks of the information presented in the main body of this Final Evaluation Report.

[5] Originally numbered 11.10 in the project proposal.

[6] In Tallinn there are three types of public transport vehicles: buses, trolleybuses and trams

2 Approach to Evaluation Within SMILE

The approach to evaluation in SMILE was developed within the wider framework specified for the CIVITAS 2 in collaboration with the CIVITAS GUARD project. CIVITAS GUARD has a role in supporting the evaluation and dissemination of all four CIVITAS 2 projects to ensure common evaluation and reporting bases across these projects so allowing presentation of comparable results at the measure and city levels as well as enabling cross-site and combined analysis of results at the programme level. Full details of the overall evaluation framework are available in GUARD Deliverable 2.1, finalised in October 2006.

2.1 Evaluation Framework

GUARD has adapted the METEOR evaluation framework that was used for the CIVITAS I projects, taking account of Projects' and Cities' own implementation and evaluation plans, to define an improved evaluation framework for CIVITAS II. Development of the evaluation framework has been pursued through an iterative process through the Evaluation Liaison Group which consists of representatives of all CIVITAS II projects. Figure 2.1 shows the evaluation framework focused on:

(i) Technical aspects

(ii) Process aspects

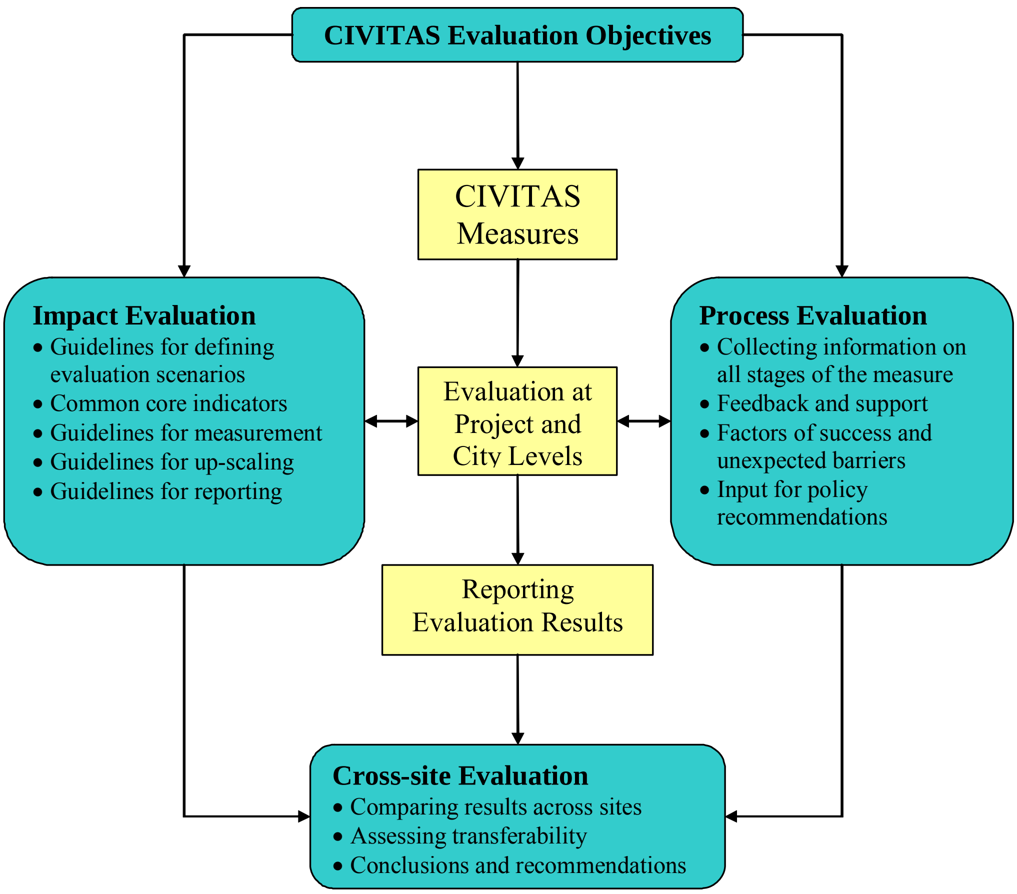


Figure 2.1 Outline of Evaluation Framework

2.1.1 Evaluation Management Structure

Evaluation played a key role in SMILE. The project partners worked together within the overall evaluation framework to conduct a thorough and structured evaluation, as described in this Evaluation Report.

The activities that needed to be conducted as part of the evaluation within SMILE are defined by the previously stated process-related objectives for the evaluation workpackage.

When combined with the overall project objectives which defined the technical content of the activities the result was a detailed and comprehensive framework for the evaluation which was designed to lead to well-defined results, useful for both evaluation and as an input to dissemination and exploitation.

The evaluation workpackage was split into several activities which are outlined in the following sections and fully laid out in the SMILE evaluation plan.

The Evaluation co-ordinator, TTR, has been responsible for workpackage 3, in particular by reviewing the quality of evaluation delivery and reporting to the SMILE Project Office and Project Management Board as appropriate.

Task 3.1: Evaluation Co-ordination

This involved the strategic level co-ordination for all SMILE evaluation activities. It was the formal project link to evaluation activities in the GUARD project and to the SMILE central Project Office and Project Management Board. The responsibilities of the evaluation co-ordinator were:

- To produce an evaluation plan for the project in collaboration with the evaluation partners at the city level and the University of West of England / Heriot Watt University who were responsible for the cumulative impact assessment for all the SMILE demonstration sites. This was subsequently developed as the basic management tool for monitoring the progress of the project's evaluation activities.
- To monitor the progress of evaluation activities. Deviations from the evaluation schedule were discussed with site evaluation managers and appropriate action taken to rectify matters within the evaluation, if the problem had an internal cause, or alert the appropriate site manager that implementation activities were causing problems for the site evaluation manager.
- To monitor the quality of evaluation activities at all stages of the project evaluation life-cycle. An evaluation quality checklist for SMILE was produced in conjunction with GUARD and the site evaluation mangers (see section 2.1.5). To conduct evaluation site audits as directed by the PMB.
- To provide necessary support to the local evaluation partners to secure high quality of the data and the evaluation results, through site visits, discussions at consortium meetings, and day-to-day contact relating to evaluation matters by telephone and e-mail correspondence.
- To produce the final evaluation report for SMILE, using inputs developed by the other SMILE evaluation partners (i.e. measure / site evaluation reports and cumulative effects assessment) and, using TTR's extensive technical experience, to present this information which addresses the various levels of the overall evaluation objectives in a coherent way.
- To co-ordinate the provision of information to the public and non-public evaluation section of the project website, ensuring that the quality of the evaluation data presented is appropriate to the target audience.
- To provide effective evaluation liaison with the GUARD project. This will be achieved by direct contact with those in GUARD responsible for both technical and process evaluation aspects,

including attendance at the periodic Evaluation Liaison Group Meetings called by GUARD and regular telephone and e-mail correspondence.

Within each partner city a site evaluation manager was appointed who, in co-operation with the evaluation co-ordinator, was responsible for overseeing the evaluation activities within their own city. This local role involved many responsibilities as the project progressed through its lifetime, in particular local responsibility for conduct and completion of tasks 3.2-3.5.

Task 3.2: The Development of Site Evaluation Plans for Direct Impact Measurement

Sites used the common guidelines, developed in conjunction with the GUARD project, to produce local site evaluation plans. The site plans reflected the requirements for cross-site integration between the evaluation in the SMILE cities and for the transferability assessment of the measures between the SMILE cities by GUARD. These detailed site plans were annexed to the SMILE evaluation plan.

Task 3.3: Data Capture at Site Level

The site evaluation plans included data collection plans that were used as a management tool by the site evaluation managers and by the SMILE evaluation co-ordinator for monitoring purposes. The quality of data collected was gauged against these plans to ensure consistent data collection procedures as far as is reasonably possible, taking into account structural and societal differences between the cities.

Task 3.4: Baseline Position at Site Level

The evaluation methodology implemented in all CIVITAS 2 projects required that, where possible, the baseline for the evaluation was a ‘business as usual’ scenario for each measure. This was designed to allow the true impact of the demonstration measures to be estimated, discounting any changes in the chosen indicators for a measure which would have occurred anyway, or which were the result of factors external to the CIVITAS demonstrations. For more information see section 2.2.

Task 3.5: Impact Evaluation at Site Level

Following continuous and ex-post data collection (quantitative and process data), each city conducted a detailed evaluation of the direct impacts of the SMILE demonstrations. A template provided by GUARD was used for the reporting of results in consistent way across all the CIVITAS projects which was ‘user friendly’ to the dissemination co-ordinator for exploitation tasks. The template and details of the expected analysis and reporting are provided in section 2.2.5 of this report.

Task 3.6: Cumulative Effects Assessment Methodology

This task built an overall analysis of the significance of the demonstrations’ results for the development of clean urban transport policy.

Initially UWE led the cumulative effects analysis tasks, although during the course of the project key staff members moved to Heriot Watt University and subsequently the cumulative effects analysis work followed. Task 3.6 involved conduct of the following activities:

- identifying which measures were suitable for a cumulative effects assessment;
- developing a matrix cross-referencing the data requirements for the cumulative effects assessment with information about the data that was to be collected for each measure in the technical evaluation;
- developing a plan to collect other data essential for the cumulative effects assessment in each city that was not due to be collected for each measure in the technical evaluation;
- developing and existing GIS model to locate each project geographically at a city level and to assess the potential for presenting the cumulative effects assessment in this way;

- to conduct an analysis of policy documents and likely developments within the areas defined for the cumulative effects assessment.

Further details are contained in section 2.2.4.

Task 3.7: Cumulative Effects Assessment at Site Level

Based on the cumulative effects methodology developed in Task 3.6, UWE / Heriot Watt conducted a cumulative effects assessment for those measures selected as suitable for such an assessment. In addition to the data collected by the sites for the technical assessment of each measure, the cumulative effects assessment was enhanced by secondary data collection activities conducted by UWE and by data collected from the SMILE cities using GUARD's process evaluation database. The activities that were conducted at each site were as follows:

- Define the spatial and temporal area of assessment;
- Undertake network analysis to identify the likely relative scope of cumulative effects;
- Undertake the CEA;

Once these activities are conducted a cumulative effects assessment report will be produced for each site in CIVITAS SMILE. Further details are contained in section 4.

2.1.2 Evaluation Responsibilities and Resources within SMILE

Table 2.2 shows the key individuals involved in managing the evaluation process that will be conducted within Workpackage 3 of SMILE, together with their individual responsibilities, including the evaluation managers for each city.

Table 2.2 Principal Evaluation Responsibilities

Position/function	Tasks and responsibilities
Project Evaluation Co-ordinator	Co-ordination of all aspects of the workpackage
Assistant Project Evaluation Co-ordinators	Responsibilities as delegated by the Project Evaluation Co-ordinator
Cumulative Effects Assessment Co-ordinator	Management of Cumulative Effects Assessment
Malmo Site Evaluation Managers	Joint management of evaluation tasks in Malmo
Norwich Site Evaluation Manager	Management of evaluation tasks in Norwich
Potenza Site Evaluation Manager	Management of evaluation tasks in Potenza
Tallinn Site Evaluation Manager	Management of evaluation tasks in Tallinn
Assistant Tallinn Site Evaluation Manager	Responsibilities as delegated by the Tallinn Site Evaluation Manager
Suceava Site Evaluation Manager	Management of evaluation tasks in Suceava
Assistant Suceava Site Evaluation Manager	Responsibilities as delegated by the Suceava Site Evaluation Manager

Workpackage 3 defined the evaluation process within SMILE. However, during the Inception Period it became apparent that much of the data collection needed for the evaluation would be conducted within the measures. The effort for this is inextricably linked to the design and implementation of the measure and it was judged impossible to extract the resources for these activities from the other activities at the measure level. This led to a consolidation of the resources declared as being within WP3 as those related to the co-ordination of the evaluation, including analysis of the data collected at the measure level using the methods defined in this Evaluation Plan.

2.1.3 The Role of GUARD

The task of GUARD was both to support and evaluate the evaluation activities conducted in SMILE and their relationship with the overall programme level evaluation. To achieve this they worked with the evaluation co-ordinator to ensure that survey approaches and analysis methods are applied consistently within individual cities, that the impacts of different measures were presented in a co-ordinated manner and that clear messages regarding the value of the measures could be identified for dissemination across Europe.

GUARD will place the eventual evaluation results from SMILE in the context of EC transport policy and findings from other studies, and carefully assess the information available and develop a clear European understanding. The outcome will be a comprehensive report on the overall CIVITAS II results, building on CIVITAS I for greater added value.

2.1.4 Risks to the Evaluation

Throughout this introduction to evaluation within SMILE various references are made to issues that present potential risks to the evaluation process within SMILE. As part of the Evaluation Plan these risks were laid out in four general categories as follows:

- Risks associated with the project being an innovative demonstration
- Risks associated with the project being a multi-partner international project within a wider European programme
- Technical risks
- Management risks

For each category the identified risks and a potential associated course of action to minimise the risk were identified and are listed in the following table.

Category	Risk	Action
Innovative Demonstration	▪ Measure failure leads to little or no data and loss of interest from measure leader / implementing team	▪ Ensure strong contact between measure leader and site evaluation team for all measures so that reasons for failure are documented through process evaluation
	▪ Scale of measure means impacts cannot be identified in isolation from other factors	▪ Indicators selected and defined wherever possible to focus closely on the measure and its direct area of implementation
	▪ The experimental nature of some of the measures means that it is likely that some measures will not be implemented according to the proposed time schedules	▪ See later under management risks
International Project &	▪ Language barrier can cause communications problems and misinterpretation	▪ Use of site evaluation team, with fluent English and local language, based in each demonstration city.

Category	Risk	Action
Programme Effects	▪ Cultural differences impact upon the way questions can be asked in different cultures leading to a non-standard approach to the same issue in questionnaires.	▪ Discussion and review to ensure as much consistency as possible
	▪ External demands leading to changes in approach or expectation fed into process by the EC or GUARD ▪ In this context timing is an issue as SMILE was the first CIVITAS II project to produce an evaluation plan, which was produced prior to the GUARD 'Framework for Evaluation' being approved by the EC. In compiling the SMILE Evaluation Plan care has been taken to conform to the intermediate versions of the GUARD 'Framework for Evaluation', but changes may be required in order to ensure consistency of approach between SMILE and the projects that follow later.	▪ The SMILE Evaluation Plan is a living document and some flexibility must be built into the evaluation process to allow for changes whether due to internal or external circumstances. External changes that can be delivered technically and which do not have significant impact on the timing, relevance, resource use or reduce the quality of the evaluation will not cause a problem. ▪ Evaluation Liaison Group meetings provide a forum for individual projects such as SMILE to check on the requirements of the EC as expressed through GUARD, to raise concerns and negotiate solutions where appropriate
Technical Risks	▪ Data availability ▪ This is a particular concern for the cumulative effects analysis as it will rely on GIS base data for the cities	▪ Feasibility of data collection has been considered in the planning stages to ensure that the proposed data can be collected. Progress monitoring (see section 4.3.1)and interim data collection (see section 3.2.4) and analysis will highlight problems as they arise so that they can be addressed ▪ See above
	▪ Data suitability due to various issues e.g. inadequate sample size, external impacts etc	▪ This will be addressed by the progress monitoring and application of the evaluation quality checklist (see section 4.3.2). GUARD also available as a recourse to check evaluation issues with regard to data quality
Management Risks	▪ Timing: The project GANTT charts show that implementation of the demonstration measures will occur throughout the 48 month project period. It is planned that some measures will be implemented early in the project (which will provide a useful test for the evaluation process). However, implementation of some measures will be phased during the project and other measures are scheduled to be implemented relatively late within the project. ▪ This is a particular concern for the cumulative effects analysis as it will rely on data collected for other evaluation tasks.	▪ Time is needed for the final data collection, analysis and reporting phases to be conducted within the contract period, such that month 44 represents the latest that final data collection can reasonably be scheduled (as shown in the overall GANTT chart). However, for many of the measures the impacts will take some time (in some cases up to a year) to become clear. Hence it is likely that any implementation after month 40 is unlikely to result in a reliable evaluation as there will not have been time for the true impacts to become apparent. ▪ Progress monitoring, interim data collection and forging good links between UWE and the site evaluation partners (including site visits) will help with this.

Category	Risk	Action
	▪ Role of Measure Leaders and their Resources: As identified in section 2.4.1 many of the resources required for evaluation of the individual measures lie within the individual measure budgets	▪ Important for evaluation co-ordinators to highlight this issue with site managers and site evaluation managers to ensure that evaluation resources within the individual measures are not overlooked or diverted. Progress monitoring and interim data collection will help with this.
	▪ Work overload: This is linked to the issue of resources (above) but also relates to the need for process evaluation which was not originally envisaged within the project proposal and which is closely linked to the management reporting, with information being required from measure leaders who are intimately involved in the implementation, barriers encountered and the methods behind the solutions that are found.	▪ GUARD has been helpful in trying to develop an online process reporting tool which will combine information collection for process evaluation and management reporting. Progress monitoring and interim data collection will help with this.

These risks were considered as likely to be magnified for the cumulative effects assessment, which largely relied on the same datasets, enhanced by background information about the SMILE cities and the evaluation context – see above comment about GIS frameworks and timing as examples.. For this reason special consideration was given to addressing these risks for the cumulative effects assessment.

2.1.5 Data Quality

In discussion with the SMILE project office, the site evaluation managers and GUARD it was agreed that a simple quality checklist should be included within the Evaluation Plan so that a set of basic guidelines was provided for the benefit of all involved in evaluation within SMILE. The following items comprised this checklist, which was used as a reference by the Evaluation Co-ordinator in case there was any ambiguity regarding the quality or content of the evaluation conducted in one of the sites.

- Has the CIVITAS reporting template been followed correctly?
- Are maps used to describe the implementation and evaluation and are they adequate? If no maps are used is there an adequate explanation of why they are not needed / applicable?
- Are all indicators listed within the evaluation plan covered?
- Does the data collection lead clearly to the chosen indicators?
- Are the assumptions used to develop the business as usual scenario clearly stated and justifiable?
- Is the sample size appropriate to the indicator and analysis?
- Is uncertainty / sensitivity analysis considered?
- Does the analysis meet the relevant GUARD guidelines (e.g. the energy and emissions checklist)?
- Have external factors (e.g. political change, bad weather, strikes) been documented (or stated as not present)?

- Has a data verification and cleaning process been conducted to remove errors or data affected by external factors? If so, has it been documented?
- What policy assumptions have been made regarding the upscaling and is the explanation clear?
- Has the process evaluation been completed?
- Does the process evaluation provide a clear record of the critical success and failure factors?

2.2 Impact Evaluation

The outline of the technical evaluation framework as defined by GUARD is shown in figure 2.2. The diagram also shows the interrelationship with the detailed definitions of the demonstrations measures - a process that has been ongoing in the inception phase of the project and the eventual use of the results via the various CIVITAS dissemination mechanisms to provide recommendations at the policy and technical levels.

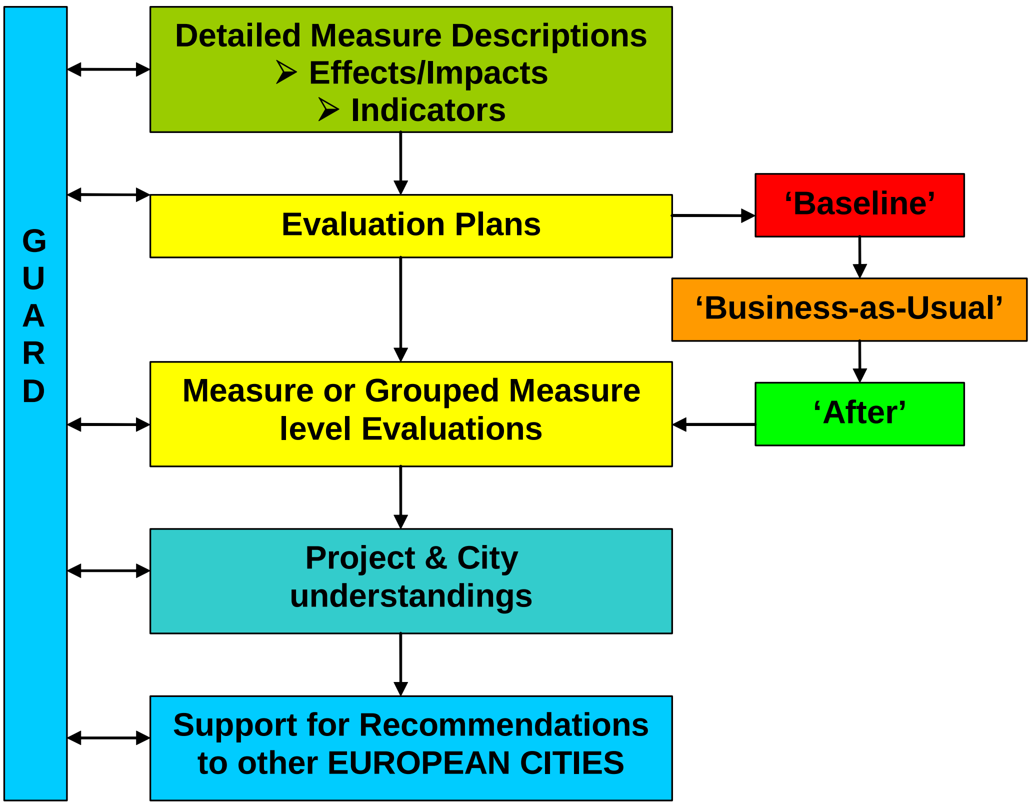


Figure 2.2: Outline of Technical Impact Evaluation Framework

Within CIVITAS I, METEOR considered five evaluation areas (economy, energy, environment, society and transport) and 24 indicators, divided into 12 subcategories: benefits, costs, energy consumption, pollution/nuisance, resource consumption, acceptance, equity, health, security, quality of service, safety and transport system. The measures in CIVITAS II were similar in terms of the areas covered to those in CIVITAS I, except for the change from "Integration of traffic management systems" (CIVITAS I) to "Telematics" (CIVITAS II)

Hence, the indicators and methods used by METEOR appeared to be a good base for GUARD to develop those to be used in the CIVITAS II projects. GUARD reviewed these in conjunction with the

CIVITAS II projects. This review indicated that the way in which the METEOR indicators were expressed was too focused on public transport, and not flexible enough for the wide range of applications within SMILE and the other CIVITAS II projects. This led to three actions:

- Revision of the METEOR indicators in order to try to produce a list of common indicators that are more flexible in their potential application (see section 2.2.2);
- Recognition that the local evaluators would know what makes most sense in terms of the evaluation of individual measures, leading to some local variations in the way in which some indicators were defined and the development of local indicators for some measures, where appropriate, in order to add to the understanding of the measure's impacts
- Recognition that not all the indicators would be appropriate for all measures, which allowed resources to be focused on the key impacts of each measure.

The selection of which indicators would be used to evaluate each of the individual measures, and to what specification, was made by the site evaluation managers in discussion with the project evaluation co-ordinator and the site managers. Where uncertainty remained, clarification and advice was sought from GUARD.

Scenarios

Figure 2.2 shows that the evaluation process involved three sets of data that related to three different situations in relation to the project implementation - the before (baseline) situation, a do nothing (business as usual) scenario and the after (ex-post) situation. This section expands further on these scenarios.

Before Situation

Baseline data was necessary to enable changes resulting from CIVITAS measures to be determined according to the indicators chosen for each measure or cluster of measures. The baseline measurements were expected to be of sufficient scale to enable expected changes to be judged statistically according to the GUARD guidelines referred to in section 2.2.3.

Business as Usual Scenario

The *business as usual* scenario involves development of an estimation of the situation at the time of the data collection after implementation of the measures assuming that the CIVITAS applications had not been introduced (taking into account for example, developments in land use or transport provision and changes at regional, national or international level such as fuel price escalation or national environmental awareness campaigns and general improvements in technology etc.). All the factors which may change during the evaluation period and which could influence travel and its impacts in the cities should be identified at an early stage of the project and be included in the baseline records. These effects may be modelled, interpreted through processes of extrapolation and prediction, or some mixture of both may be used. This will depend on the data and models available on a city-to-city basis.

This was a process to be undertaken at the level of individual measures for those measures where a business as usual scenario is appropriate and feasible. At a workshop held by GUARD three possible approaches to the development of business as usual scenarios were discussed:

- Reference to historic time series data;
- Transport network modelling;
- Reference to comparator sites.

The appropriate method should be chosen depending upon the nature of the measure, data availability etc. However, it should be noted that

- The use of comparator sites was found to be difficult in CIVITAS 1
- Where the implementation occurs over a short timescale then a business as usual scenario may not be appropriate and the baseline data can be used
- It was recognised as being difficult to develop meaningful business as usual scenarios for attitudinal indicators.

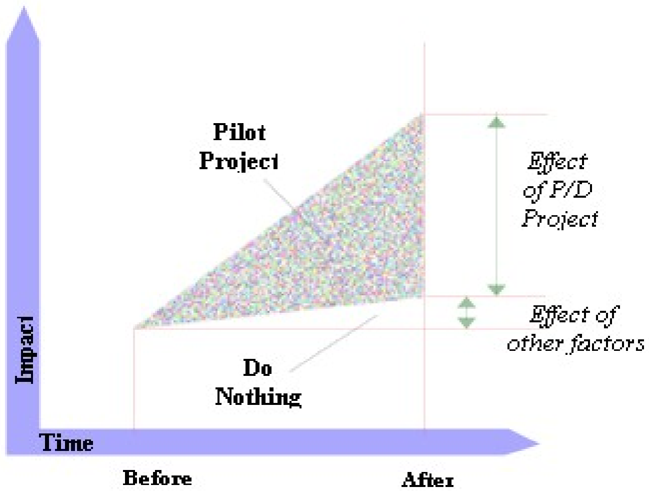


Figure 2.3: Before (Baseline), Do-nothing (Business-as-Usual) and After (Ex-post) scenarios (from MAESTRO, 1999)

It is worth remembering that measure evaluation can be clustered and this may be relevant in developing business as usual scenarios.

Examples include:

- For implementation of a bus corridor, use of a comparable route in the same city where a bus corridor is not implemented may give data for the business as usual scenario;
- For a measure for marketing of new bus lines, where any studies of the implementation of the new bus lines on their own (i.e. without a marketing campaign) may provide the business as usual scenario.

It is important that the basis of the business as usual scenario is explained well by the site evaluation team in the reporting template and that any assumptions are clear. As evaluation co-ordinator, TTR has been the first judge of this, prior to sending information to GUARD.

Business as usual scenarios were also needed within the cumulative effects analysis and this has been dealt with using site interviews.

After Situation

The *ex post* evaluation provided a final set of values that will be compared with outputs of the business as usual (do nothing) scenario for each measure according to the chosen indicators. This comparison will show the impact of the measures according to the list of expected analyses in section 2.2.1.

2.2.1 Data Analyses

The technical evaluation provides data and appropriate analysis on a measure by measure basis, tabulated according to the chosen indicators for each measure. The data and analysis presented for each measure consists of some or all of the following, depending on various factors such as the extent and nature of the data, the implementation timescale and the indicators that were considered relevant to the measure:

- the baseline values (as collected from before surveys or existing data)
- the business as usual scenario value (the baseline value, modified where appropriate according to the guidelines to the business as usual scenario) to provide an estimate of the after situation if the SMILE project had not been implemented
- the actual after value (as collected from after surveys or ongoing data collection)
- the absolute and percentage differences in the do nothing vs. after comparison for each measure / indicator combination
- the absolute value of the cost effectiveness coefficient for each measure / indicator combination, calculated as the absolute differences in the do nothing vs. after comparison divided by the absolute cost of implementing the measure within SMILE
- any additional comments or explanations that are appropriate to put the numerical results in context; e.g. definition of the scale of the implementation or the relationship between the measure and the overall transport system.

Upscaling

Some demonstration measures have been applied sufficiently widely that the effects will not need to be scaled up to city level, or to the maximum level that is relevant to the city. However, many measures were not of such a scale because they have been implemented on a demonstration basis on one route or in one zone of the city or for a small proportion of the population spread across the city. In such cases, where possible the effects of wider application have been estimated. This is referred to as ‘upscaling’.

At a workshop held by GUARD three scenarios were devised:

1. What is technically possible by the end of SMILE
2. What might be practically possible by the end of SMILE
3. What might be practically possible by 2015

In the context, ‘practically possible’ means taking account of political, geographical, system, capacity and financial constraints.

Decisions about the extent of implementation in these scenarios have been made locally and written down as part of the reporting process. Hence it is important that the basis of each scenario is explained well and that any assumptions are clear. Possible approaches to this included modelling and expert analysis. However, given that this had to be done within the resources available for project level evaluation, detailed analyses were not considered practical / appropriate. Even then, it has been difficult to consider this in any meaningful way given the potential for other interventions within the partner cities by 2015.

Measure Level Evaluation

As stated previously, for most measures implementation was not at a scale that corresponded to the full scale of the city and so the effects of wider application of individual measures across the city were estimated in order to allow comparison of individual measures within each city, via the cumulative effects assessment.

Within SMILE not all measure types were implemented in all cities. For example, a particular measure type may have been implemented in Malmo and not implemented in Norwich even though it might be appropriate. Therefore some estimate of the impacts of measures in other cities within the project, where implementation would be appropriate, could potentially be useful. This work has been carried out by GUARD, based in part on the assessment of the issues related to transferability of the measures, as laid out in section 4.

Clustered Measures

Where two or more measures were implemented in a highly interrelated manner it has proven sensible, or even essential, to conduct a linked evaluation because:

- The measures were implemented on the same mode of transport in the same impact area
- The expected impacts, chosen indicators, measurement route and timings of the measures are such that it proved impossible to separate the impacts

In such cases the evaluation has followed the same structure as for the evaluation of an individual measure. Where possible, efforts have been made to quantify the relative contributions of the various measures to each impact, although in many cases this has proved difficult to do accurately (or in some cases impossible).

City Level

The measure level outputs discussed above attempt to consider individual measures on an exclusive basis. However, for many measures there is a degree of complementarity in their implementation with other measures, and the full benefit will be felt when they are implemented as a package of measures. The cumulative effects assessment (tasks 3.6 and 3.7) is focused on this type of assessment, as well as capturing the interaction with other non-SMILE transport measures and other significant non-transport policies.

2.2.2 Evaluation Indicators

The indicators used by METEOR in CIVITAS have been used by GUARD as the starting point for development of the core set of indicators used throughout CIVITAS II. In discussions with the various relevant actors involved in evaluation within the CIVITAS II projects (particularly the evaluation co-ordinators and site evaluation managers) GUARD realised that:

- The original METEOR indicators were too tightly defined for public transport applications to be of use for all CIVITAS II measures, many of which relate to more general aspects of personal travel and also to freight transport. This has resulted in a loosening on the definition of some of the indicators to improve flexibility in their application.

- The imposition of a top-down approach, requiring all indicators to be collected for all measures according to a fixed format would be a poor use of the resources available for evaluation within the projects.

The result of this process was that:

- GUARD indicated that a bottom-up approach to the definition and use of the evaluation indicators would be followed. This means that in the first instance the site evaluation managers have the opportunity to decide which indicators are appropriate to measuring the relative success of the measures within their sites. In the case of SMILE this was done in discussion with the project evaluation co-ordinator who was able to give advice about suitability based on the need to provide information in the wider context of the project as a whole and the CIVITAS programme.
- The site evaluation managers also had the flexibility to define the indicators in a way that was meaningful to their local evaluation. The role of the modified GUARD indicator list became one of providing a template for indicators in the case where an indicator was recognised as being valid for a particular measure, but where there was no pre-existing data or concept within the city as to how it should be measured.

The revised set of GUARD indicators is shown in table 2.3. GUARD also produced 'methodology sheets' to help sites to understand the workings of these standard indicators.

Table 2.3 Table of Revised CIVITAS II Common Core Indicators

NO.	EVALUATION CAT EGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
	ECONOMY					
1		**Benefits**	Operating Revenues	Operating Revenues	Operating Revenues. relevant to demonstration (per pkm where available)	Euros , Euros/pkm, or Euros/vkm quantitative, derived or measurement
2		**Costs**	Operating Costs	Operating Costs	Total Costs relevant to demonstration, including set up costs (per pkm where available)	Euros , Euros/pkm, or Euros/pkm quantitative, derived or measurement
	ENERGY					
3		**Energy Consumption**	Fuel Consumption	Vehicle fuel efficiency	Fuel used per vkm, by vehicle type as relevant to demonstration	MJ/vkm, quantitative, derived or measurement
4				Fuel mix	Percentage of fuel used by type, per vehicle type or % of vehicles running on a type of fuel	%, quantitative, derived or measurement
	ENVIRONMENT					
5		**Pollution/Nuisance**	Air Quality	CO levels	CO concentration	ppm or g/m3, quantitative, measurement
6				NOx levels	NOx concentration	ppm or g/m3, quantitative, measurement
7				Particulate levels	Particulate (PM_{10} and/or $PM_{2.5}$) concentration	ppm or g/m3, quantitative, measurement
8			Emissions	CO_2 emissions	CO_2 per vkm by type	g/vkm, quantitative, derived
9				CO emissions	CO per vkm by type	g/vkm, quantitative, derived
10				NOx emissions	NOx per vkm by type	g/vkm, quantitative, derived
11				Small particulate emissions	PM_{10} and/or $PM_{2.5}$ per vkm by type	g/vkm, quantitative, derived
12			Noise	Noise perception	Perception of noise	% of people troubled by noise, qualitative, collected, survey (may be replaced by measurement or modelled data where appropriate)

NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
	SOCIETY					
13		**Acceptance**	Awareness	Awareness level	Degree to which the awareness of the policies/measures has changed	% of people aware of measure, qualitative, collected, survey
14			Acceptance	Acceptance level	Attitude survey of current acceptance with the measure	% of people who favourably receive or approve of measure, qualitative, collected, survey
15		**Accessibility**	Spatial Accessibility	Perception of accessibility	Attitude survey of perception of physical accessibility of PT network (distance to nearest PT stops) or other measure	Index of accessibility perception on a 5-point scale, qualitative, collected, survey
16			Economic Accessibility	Relative travel cost	Cost of travel related to average personal income (e.g. cost of a weekly, monthly or annual pass in proportion of the average weekly, monthly or annual income, respectively)	% or %-based index, quantitative, derived
17		**Security**	Security	Perception of security	Perception of security when using a transport service	Index, qualitative, collected, survey
	TRANSPORT					
18		**Quality of Service**	Service reliability	Accuracy of timekeeping	Percentage of services arriving / departing on time compared to timetables	%, quantitative, collected, measurement (each city should fix the interval of time considered as a delay compared with timetable)
19			Quality of service	Quality of service	Perception of service quality related to measure	Index, qualitative, collected, survey
20		**Safety**	Transport Safety	Injuries and deaths caused by transport accidents	General transport accident no. within the city causing injured and deaths	Number of accidents, injuries or fatalities, quantitative, measurement
21		**Transport System**	Traffic Levels	Traffic flow by vehicle type	Average vehicles per hour by vehicle type - peak (in context of road type)	Vehicles per hour, quantitative, derived
22				Traffic flow by vehicle type	Average vehicles per hour by vehicle type - off peak (in context of road type)	Vehicles per hour, quantitative, derived

NO.	EVALUATION CAT EGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
23			Congestion Levels	Average vehicle speed - peak	Average vehicle speed over total network or on specified route	km/hr, quantitative, derived
24				Average vehicle speed - off peak	Average vehicle speed over total network or on specified route	km/hr, quantitative, derived
25			Freight Movements	Total no. of goods vehicles moving in demo areas per day	Assessment of whether the daily no. of goods vehicles accessing city centre changes as a result of the demonstrations	Quantitative, derived or measurement
26			Modal split	Average modal split-passengers	Percentage of pkm for each mode to include walking, cycling, bus, tram, metro, train, car (driver & passenger), motorcycle	% pkm, quantitative, derived
27				Average modal split-vehicles	Percentage of vkm for each mode to include walking, cycling, bus, tram, metro, train, car (driver & passenger), motorcycle	% vkm, quantitative, derived
28			Vehicle Occupancy	Average occupancy	Mean no. persons per vehicle/day. May be applied to buses, trams metro or cars as appropriate	Persons/vehicle, quantitative, derived, measurement
29			Modal split	Average modal split-trips	Percentage of trips bymode to include walking, cycling, bus, tram, metro, train, car (driver & passenger), motorcycle	% trips, quantitative, derived

The revisions to the GUARD indicators meant that there was a better match between the indicators that used to evaluate the measures in the SMILE sites and the 'official' indicator table. Even so, within the individual site evaluation plans some innovative indicators that relate to the defined objectives of specific measures were added, whilst other indicators were judged to be inappropriate or not measurable once the implementation had been conducted. Concerns also remained about the suitability of some of the indicators, as listed below.

- METEOR indicators 5 and 9, which relate to CO, were considered to be largely redundant in countries that have already fully implemented EC directives relating to European emissions standards.
- Because of the difficulty in linking transport emissions directly to pollutant concentrations without having to go through a complex set of dispersion modelling calculations, it was considered better to concentrate on the transport emissions indicators. (For pollutant concentrations it would be possible to estimate the % contribution of transport emissions to a city's air quality problem and then limit our air quality evaluation to a statement on the lines of 'in the baseline situation NOx levels were Xppm, of which 25% were due to transport emissions' which would show a) how close Xppm is to the statutory limit i.e. how bad the overall problem is, b) how significant the transport contribution is to the overall problem and c) how big an impact might occur at the city level from a particular emissions reduction of y% of transport emissions from a particular measure. This would have required a disproportionate amount of effort for the results generated.)
- Quality of service (indicator No.19) is mentioned in respect of a public survey. Tallinn do not want to be restricted to a public survey when they already use a combination of 5 'hard' and several 'soft' indicators to measure service quality. It may be that these indicators could be of use to the other SMILE cities to give a fuller picture of public transport service quality rather than relying solely on the public attitude survey.
- Area-wide noise is difficult to influence. Perception surveys can be difficult to conduct to a meaningful outcome and area-wide measurements may prove expensive if a measurement programme is not already in place. A calculation algorithm for noise based on traffic flows, traffic speeds, traffic composition, type of road surface, width of road, distance to facades etc. may be more appropriate, possibly backed up with some perception questions about the impact of different vehicle types on noise levels, visual intrusion etc. For specific measurements, such as individual vehicles, then measurements become more appropriate.

Measure Evaluation Summary Table

Each city's site evaluation plan contained a detailed assessment of the relevance of each indicator to each of its measures, together with the method, timing and responsibility for those indicators to be used on a measure by measure basis. The measure evaluation summary table presented in this section shows which indicators are considered relevant for each of the measures, grouped by workpackage in order to highlight similarities across the measures in the various topic areas.

The measures are marked according to a nomenclature developed by GUARD, where:

Y = Indicator was considered relevant and would be addressed for this measure according to GUARD's standard definition for this indicator;

P = Indicator was considered relevant and would probably be addressed for this measure, or will be addressed but in a manner that does not correspond directly to GUARD's standard definition for this indicator;

N = Indicator was considered relevant, but would not be addressed[7];

Blank = Indicator is not relevant to this measure.

The table also indicates, where additional local indicators have been developed for a particular measure, how many such additional indicators apply to that measure.

As noted in section 2.2.4, discussion with the site evaluation managers indicated that the total cost of each measure should not be regarded as an indicator, as it is not in itself a measure of the performance of the measure. Instead it was listed as a separate, compulsory item to be determined for each measure to be used as part of the cost effectiveness analysis. For this reason the total cost is not included in the following table.

[7] N only occurs twice within the table. This was in relation to the measurement of operating revenues for the two public transport measures in Tallinn, numbers 12.5 and 12.6. Because of the way that public transport ticketing is controlled in Tallinn it was not be possible to isolate any direct impact on operating revenues for the services affected by these measures from the overall operating revenues from all public transport services in the city. Hence, any effect will be swamped by the overall city data, meaning that there was no point in collecting this data.

Measure	Leader		Indicators																												
			Economy		Energy		Environment								Society					Transport											
		No. of Additional indicators	1 Operating Revenues	2 Operating Costs	3 Vehicle Fuel Efficiency	4Fuel mix	5 CO Levels	6 NOx Levels	7 Particulate Levels	8 CO_2 Emissions	9 CO Emissions	10 NOx Emissions	11 Particulate Emissions	12 Noise Perception	13 Awareness Level of Measure	14 Acceptance Level of Measure	15 Perception of Transport Accessibility	16 Relative Cost of Transport Services	17 Perception of Security	18 Accuracy of Timekeeping	19 Quality of Transport Service	20 No. of Injuries and Deaths in Accidents	21 Vehicle Flow by Vehicle Type - peak	22 Vehicle Flow by Vehicle Type -off peak	23 Average Vehicle Speed - peak	24 Average Vehicle Speed - off peak	25 No. of Goods Vehicles In Demo Areas	26 Average Modal split - passenger kilometres	27 Average Modal split - vehicle kilometres	28 Average Vehicle Occupancy	29 Average Modal split - trips
5.1 Clean Municipal Fleet	Mal	1			Y	P				Y		Y	Y		Y	Y														Y	
5.2 Biogas on the Net	E.on		P	P		P				Y		Y	Y		Y	Y															
5.3 Clean Heavy Vehicles	Skan		P	P	Y	P				Y		Y	Y		Y	Y							Y	Y	Y	Y	Y				
5.4 Alternative fuel vehicle fleets - bio-diesel trials	UEA			Y	Y	Y				Y	Y	Y	Y		Y	Y															
5.5 Clean Vehicles	CP			Y	Y	Y				Y	Y	Y	Y	Y	P	P															
5.6 Alternative Fuel Bus Fleet	SM		Y	Y	Y					P	Y	Y	Y	Y	Y	Y		P		P	Y										
5.7 Promotion of Alternative Fuels in Public and Private Sector	SM		Y	Y	Y		Y	Y	Y					Y	Y	Y												Y		Y	
5.8 Environmentally adopted cars (new measure)	UMAS		Y	Y	Y					Y		Y	Y		Y	Y															

Measure	Leader		Indicators																												
			Economy		Energy		Environment								Society					Transport											
		No. of Additional indicators	1 Operating Revenues	2 Operating Costs	3 Vehicle Fuel Efficiency	4Fuel mix	5 CO Levels	6 NOx Levels	7 Particulate Levels	8 CO_2 Emissions	9 CO Emissions	10 NOx Emissions	11 Particulate Emissions	12 Noise Perception	13 Awareness Level of Measure	14 Acceptance Level of Measure	15 Perception of Transport Accessibility	16 Relative Cost of Transport Services	17 Perception of Security	18 Accuracy of Timekeeping	19 Quality of Transport Service	20 No. of Injuries and Deaths in Accidents	21 Vehicle Flow by Vehicle Type - peak	22 Vehicle Flow by Vehicle Type -off peak	23 Average Vehicle Speed - peak	24 Average Vehicle Speed - off peak	25 No. of Goods Vehicles In Demo Areas	26 Average Modal split - passenger kilometres	27 Average Modal split - vehicle kilometres	28 Average Vehicle Occupancy	29 Average Modal split - trips
6.1 Extended Environmental Zone	Mal					Y		Y	Y	Y		Y	Y		Y	Y											Y				
6.2 New Low Emission Zone	UEA				Y			Y	Y			P	Y		Y	Y					Y										
6.3 Time-controlled access restrictions	Norw	1												Y		Y							Y	Y							
6.4 Extension of Low Emission Zone	SM						Y	Y	Y					Y	Y	Y						Y	P	P				Y	Y		
7.1 Marketing of Clean Vehicles by Subsidised Parking	Mal	2								Y		Y	Y		Y	Y															
7.2 Influencing vehicle choice to smaller / more fuel efficient vehicles	Norw	1			Y					Y					Y	Y															
8.1 Marketing of New Bus Network	Skan	1													Y	Y													P	Y	
8.2 Security / Safety Improved on Buses	Skan			P											Y	Y	Y		Y											Y	

Measure	Lea der	No. of Additional indicators	Indicators																											
			Economy		Energy		Environment								Society					Transport											
			1 Operating Revenues	2 Operating Costs	3 Vehicle Fuel Efficiency	4Fuel mix	5 CO Levels	6 NOx Levels	7 Particulate Levels	8 CO_2 Emissions	9 CO Emissions	10 NOx Emissions	11 Particulate Emissions	12 Noise Perception	13 Awareness Level of Measure	14 Acceptance Level of Measure	15 Perception of Transport Accessibility	16 Relative Cost of Transport Services	17 Perception of Security	18 Accuracy of Timekeeping	19 Quality of Transport Service	20 No. of Injuries and Deaths in Accidents	21 Vehicle Flow by Vehicle Type - peak	22 Vehicle Flow by Vehicle Type -off peak	23 Average Vehicle Speed - peak	24 Average Vehicle Speed - off peak	25 No. of Goods Vehicles In Demo Areas	26 Average Modal split - passenger kilometres	27 Average Modal split - vehicle kilometres	28 Average Vehicle Occupancy	29 Average Modal split - trips
8.3 Integration of Cycling with Public Transport	Mal	1														P					P	Y							Y		Y
8.4 Rail Station interchange	Norf		Y	Y											Y	Y			Y		Y							Y			
8.5 On-street ticket vending machines	Norf		Y	Y											Y	Y	Y			Y	Y				Y	Y		P		Y	
8.6 Linking passenger transport info with healthcare	ML	1		Y											Y	Y	Y	P	P	Y	Y							Y			
8.7 Dial a ride	CP		Y	Y											Y	Y	Y			Y	Y										
8.8 Bus Priority Measures and Other Improvements	SM														Y	Y	Y		Y		Y				Y	Y			Y	Y	
8.9 Improved Public Transport Info	SM														Y	Y	Y		Y		Y				Y	Y			Y	Y	

Measure	Leader	No. of Additional indicators	Indicators																												
			Economy		Energy		Environment								Society					Transport											
			1 Operating Revenues	2 Operating Costs	3 Vehicle Fuel Efficiency	4Fuel mix	5 CO Levels	6 NOx Levels	7 Particulate Levels	8 CO_2 Emissions	9 CO Emissions	10 NOx Emissions	11 Particulate Emissions	12 Noise Perception	13 Awareness Level of Measure	14 Acceptance Level of Measure	15 Perception of Transport Accessibility	16 Relative Cost of Transport Services	17 Perception of Security	18 Accuracy of Timekeeping	19 Quality of Transport Service	20 No. of Injuries and Deaths in Accidents	21 Vehicle Flow by Vehicle Type - peak	22 Vehicle Flow by Vehicle Type -off peak	23 Average Vehicle Speed - peak	24 Average Vehicle Speed - off peak	25 No. of Goods Vehicles In Demo Areas	26 Average Modal split - passenger kilometres	27 Average Modal split - vehicle kilometres	28 Average Vehicle Occupancy	29 Average Modal split - trips
9.1 Car Sharing for Business and Private Persons	Sun		P	P	Y	Y				Y		Y	Y		Y	Y												P	P	Y	P
9.2 City centre car-sharing club	Norw	2			Y					Y	P	P	P		Y	P												P	P		
9.3 Car pooling	CP														Y	Y														Y	
10.1 Freight Driver Support (new measure)	LBC			Y	Y					Y		Y	Y		Y	Y									Y	Y					
10.2 Satellite Traffic Management System for SMEs	215 215[8]	2	Y	Y	Y	Y				Y		Y	Y		Y	Y							Y	Y	Y	Y					
10.3 Development of Strategic Freight Stakeholders Club	Norf														Y	Y							Y	Y	Y	Y					

[8] 215215 is the name of the company implementing the measure.

Measure	Leader	No. of Additional indicators	Indicators																												
			Economy		Energy		Environment								Society					Transport											
			1 Operating Revenues	2 Operating Costs	3 Vehicle Fuel Efficiency	4Fuel mix	5 CO Levels	6 NOx Levels	7 Particulate Levels	8 CO_2 Emissions	9 CO Emissions	10 NOx Emissions	11 Particulate Emissions	12 Noise Perception	13 Awareness Level of Measure	14 Acceptance Level of Measure	15 Perception of Transport Accessibility	16 Relative Cost of Transport Services	17 Perception of Security	18 Accuracy of Timekeeping	19 Quality of Transport Service	20 No. of Injuries and Deaths in Accidents	21 Vehicle Flow by Vehicle Type - peak	22 Vehicle Flow by Vehicle Type -off peak	23 Average Vehicle Speed - peak	24 Average Vehicle Speed - off peak	25 No. of Goods Vehicles In Demo Areas	26 Average Modal split - passenger kilometres	27 Average Modal split - vehicle kilometres	28 Average Vehicle Occupancy	29 Average Modal split - trips
10.4 Priority access for clean goods vehicles	Norf				Y	Y				Y	Y	Y	Y		Y	Y							Y	Y	Y	Y	Y				
10.5 Urban transhipment centre	Norf					P				Y	Y	Y	Y		Y								Y	Y	Y	Y	Y				
10.6 Goods delivery to Park and Ride sites	Norf			Y						Y					Y	Y			Y	Y	Y						Y	P		Y	
10.7 Sustainable SME logistic for the food industry (new measure)	Mal			Y	Y					Y	Y	Y	Y		Y								Y	Y	Y	Y					
11.1 Managing Mobility Needs of Private Persons & Business Sector	Mal									P		P	P		Y	Y												P	P		P
11.2 Eco-driving for Municipal Employees	Mal				Y										Y	Y															

Measure	Leader		Indicators: Economy		Energy		Environment								Society					Transport											
		No. of Additional indicators	1 Operating Revenues	2 Operating Costs	3 Vehicle Fuel Efficiency	4Fuel mix	5 CO Levels	6 NOx Levels	7 Particulate Levels	8 CO_2 Emissions	9 CO Emissions	10 NOx Emissions	11 Particulate Emissions	12 Noise Perception	13 Awareness Level of Measure	14 Acceptance Level of Measure	15 Perception of Transport Accessibility	16 Relative Cost of Transport Services	17 Perception of Security	18 Accuracy of Timekeeping	19 Quality of Transport Service	20 No. of Injuries and Deaths in Accidents	21 Vehicle Flow by Vehicle Type - peak	22 Vehicle Flow by Vehicle Type -off peak	23 Average Vehicle Speed - peak	24 Average Vehicle Speed - off peak	25 No. of Goods Vehicles In Demo Areas	26 Average Modal split - passenger kilometres	27 Average Modal split - vehicle kilometres	28 Average Vehicle Occupancy	29 Average Modal split - trips
11.3 Travel planning	Norf	1		Y						P	P	P	P		Y	Y													Y		
11.4 Car-pooling	Norf	1		Y						Y	P	P	P		Y	Y			Y				P	P						Y	
11.5 Individual travel advice	UEA									Y	P	P	P		Y	Y			Y										P	Y	
11.6 Mobility centre	CP		Y	Y						Y	Y	Y			Y	Y													Y		
11.7 Information and Awareness	SM														Y	Y	Y		Y		Y				Y	Y			Y	Y	
11.8 Eco driving for hospital employees (new measure)	UMAS				Y	Y				Y		Y	Y		Y	Y												Y	Y		
11.9 Heavy eco driving (new measure)	LBC				Y					Y		Y	Y		Y	Y				Y		Y									
12.1 Use of Real Time Applications for Traveller Services	Skan														Y	Y				Y	Y									Y	

Measure	Leader	No. of Additional indicators	Indicators																												
			Economy		Energy		Environment								Society					Transport											
			1 Operating Revenues	2 Operating Costs	3 Vehicle Fuel Efficiency	4Fuel mix	5 CO Levels	6 NOx Levels	7 Particulate Levels	8 CO_2 Emissions	9 CO Emissions	10 NOx Emissions	11 Particulate Emissions	12 Noise Perception	13 Awareness Level of Measure	14 Acceptance Level of Measure	15 Perception of Transport Accessibility	16 Relative Cost of Transport Services	17 Perception of Security	18 Accuracy of Timekeeping	19 Quality of Transport Service	20 No. of Injuries and Deaths in Accidents	21 Vehicle Flow by Vehicle Type - peak	22 Vehicle Flow by Vehicle Type -off peak	23 Average Vehicle Speed - peak	24 Average Vehicle Speed - off peak	25 No. of Goods Vehicles In Demo Areas	26 Average Modal split - passenger kilometres	27 Average Modal split - vehicle kilometres	28 Average Vehicle Occupancy	29 Average Modal split - trips
12.2 Traffic Monitoring	Mal									Y		Y	Y										Y	Y	Y	Y					
12.3 Mobile Internet Services for Bus Info	Skan														Y	Y				Y	Y									Y	
12.4 Internet Tool for Traffic Planning	Mal														Y	Y															
12.5 Public Transport Priority System	TM		N	P	Y[9]					Y[8]	Y[8]	Y[8]	Y[8]		Y	Y				Y[10]	Y		Y	Y	Y[8]	Y[8]		Y	Y	Y	
12.6 Automatic Stop Calls and Info Signs in public transport vehicles	TM		N												Y	Y					Y									Y	

[9] Only for buses and trolleybuses on priority routes.

[10] Only for part of the network where the PT priority system will be implemented

Measure	Leader	No. of Additional indicators	Indicators																												
			Economy		Energy		Environment								Society					Transport											
			1 Operating Revenues	2 Operating Costs	3 Vehicle Fuel Efficiency	4Fuel mix	5 CO Levels	6 NOx Levels	7 Particulate Levels	8 CO_2 Emissions	9 CO Emissions	10 NOx Emissions	11 Particulate Emissions	12 Noise Perception	13 Awareness Level of Measure	14 Acceptance Level of Measure	15 Perception of Transport Accessibility	16 Relative Cost of Transport Services	17 Perception of Security	18 Accuracy of Timekeeping	19 Quality of Transport Service	20 No. of Injuries and Deaths in Accidents	21 Vehicle Flow by Vehicle Type - peak	22 Vehicle Flow by Vehicle Type -off peak	23 Average Vehicle Speed - peak	24 Average Vehicle Speed - off peak	25 No. of Goods Vehicles In Demo Areas	26 Average Modal split - passenger kilometres	27 Average Modal split - vehicle kilometres	28 Average Vehicle Occupancy	29 Average Modal split - trips
12.7 Bus Priority System	Mal									P		P	P		Y	Y				Y	Y		Y	Y	Y	Y				Y	
12.8 Customised traffic and travel info service for freight operators	Norf			Y				P		Y		Y	Y		P	P							Y	Y							
12.9 Provision of real-time travel info	Norf														Y	Y	Y		Y		Y							Y	Y	Y	

2.2.3 Data Collection Methods

Data collection can be conducted in a variety of ways depending on the indicator in question and to varying specifications which will determine its reliability. General guidance notes were developed by GUARD to form the basis for identifying the type, quality and approaches to collecting data for each indicator and situation. This guidance formed the basis on which decisions were made at site level regarding the data collection methodology used, always bearing in mind the evaluation resources that were available.

Before embarking on any survey, whether by direct measurement or questionnaire, it was useful to consider a number of basic points:

- **Objectives of the survey**. A clear statement was always helpful, as it is easy to get involved in the detail and make decisions at variance with the objectives.
- **Population to be sampled**. The population is the aggregate group of people or objects of interest. For a questionnaire survey on the opinions of a city's residents about transport and related issues, the population is the number of people in the city. Alternatively, the population could be a specific group in society, such as people who use a specific bus service.
- **Relevance of data**. All data collected should be relevant and no essential data omitted. With questionnaires there is often a tendency to ask too many questions, some of which are subsequently never analysed. An overlong questionnaire lowers the quality of the answers to the important questions as well as the less important ones.
- **Precision required**. Results of sample surveys are always subject to some uncertainty, because only a part of the population is being measured and because of errors of measurement. This uncertainty can be reduced by taking larger samples and by using better means of measurement, but both can be costly. Hence it is important to specify the degree of precision wanted in the results; this is further considered later in this section.
- **Method of measurement**. This may include a choice of measurement equipment or approaches to the population, e.g. interview, self-completion questionnaire; use of mail, telephone, email, text message, personal visit, etc.
- **Sample units**. These are the separate, non-overlapping parts of the population that are to be sampled. This is often obvious, for instance a bus from a fleet of buses. But in sampling people in a city, the unit may be an individual, a family or perhaps drivers aged 17-20 living in a specific area.
- **Sample selection**. A plan is required as to how the sample is to be selected and survey administered. A number of different plans may be possible so for each a rough estimate of the sample size (based on the degree of precision required) will help to provide comparative costs.
- **Pilot test**. A pilot test of the questionnaire and approach is always useful to identify problems of understanding/interpretation of the questions and of the method of conducting the survey.
- **Fieldwork organisation**. Staff will need special training for the survey. Adequate supervision is required and early checking of the quality of the collected information is invaluable.

Further consideration of some of the above points is provided in the following sections.

Suggested Sample Sizes

In order to achieve its objectives the evaluation process within SMILE were designed wherever possible to collect sufficient data to be able to make statistically valid conclusions about the impact of the demonstrated measures. Hence, it was important to give proper consideration to the size of sample collected. This is always a balance between accuracy and resources, as too large a sample can be a waste of resources while too small a sample may diminish the usefulness of the results.

The main steps involved in deciding a sample size, n, are as follows:

(1) The desired precision of the result needs to be determined. This is likely to be in terms of the accepted confidence interval (or margin of error) around the sampled result and the level of chance that the true result is outside this range. For instance, it may be required that the result lies within +/- 3% of the true result and that there is a 95% level of confidence that this is correct.

(2) An appropriate formula for linking n with the desired precision is required.

(3) If results are required for subsets of the population, then separate calculations need to be made for each subset and the total n found by addition.

(4) Usually more than one item or characteristic is measured in a sample survey and each may require a different degree of precision. The required sample values then need to be reconciled.

(5) Finally, the chosen value of n must be appraised to see whether such a sample size is feasible within the resources available. If not, the desired precision may need to be reviewed or greater reliance given to combination with results from similar measures in other cities to give the required precision.

Statistical validity is conventionally defined using 'confidence limits' that are calculated according to the size of the change that is detected and the size of the sample from which the result is inferred. The value of the confidence limits defines the range either side of the measured value within which we can be confident to a certain degree that the actual value lies.

For example:

If we infer a percentage change of 6.2% with a confidence limit of 2.1% at the 95% level, this means that we can be 95% certain that the actual value is somewhere between the limits of 6.2 ± 2.1% i.e. between 4.1% and 8.3%.

Although other degrees of confidence limit (e.g. 90% or 99%) are available, 95% is by far the most widely used.

Sample Size within a Survey

Under the assumption that the population to be sampled is approximately normally distributed (this is usually the case), the formula for the estimation of the appropriate sample size to draw from the target group is given below. (This is based around the statistical uncertainty associated with basing a result on a random sample of the full population.)

Sample size for a proportion, p:

$$n = [t^2PQ/d^2] / [1 + (t^2PQ/d^2 - 1)/N] \qquad (1)$$

where: n = sample size

t = the abscissa of the Normal distribution for the chosen confidence limit (1.96 for a 95% confidence limit)

P = expected percentage result from the sample

Q = (1-P)

d = margin of error

N = population total

This simplifies to the following equation, assuming that the total population is much larger than the sample, expressed at the 95% confidence limit:

$$n = (3.84\ P\ (1\text{-}P))\ /\ d^2 \quad \text{or} \quad d = 1.96\ \sqrt{(P\ (1\text{-}P)/n)}$$

Examples of the output from this equation are shown in Table 2.4, which shows the margin of error that applies for various combinations of sample size (Y axis) and percentage result (X axis). The figures indicate that if a survey of 200 persons shows that 10% of people hold a particular opinion then we can be 95% confident that the true percentage change is 10% plus or minus 4.2%. This means we can be 95% confident that the true figure lies between 5.8% and 14.2%. The table also shows that as the percentage result approaches 50% then the uncertainty increases i.e. for the same survey of 200 people if the result is 50% then we can be 95% confident that the true figure lies between 43.1% and 56.9%.

Table 2.4 Margin of error at the 95% level derived for sample size / percentage combinations

Sample Size	Percentage Result												
	2.5	5	7.5	10	12.5	15	20	25	30	35	40	45	50
50	4.3	6.0	7.3	8.3	9.2	9.9	11.1	12.0	12.7	13.2	13.6	13.8	13.9
100	3.1	4.3	5.2	5.9	6.5	7.0	7.8	8.5	9.0	9.3	9.6	9.8	9.8
150	2.5	3.5	4.2	4.8	5.3	5.7	6.4	6.9	7.3	7.6	7.8	8.0	8.0
200	2.2	3.0	3.7	4.2	4.6	4.9	5.5	6.0	6.4	6.6	6.8	6.9	6.9
250	1.9	2.7	3.3	3.7	4.1	4.4	5.0	5.4	5.7	5.9	6.1	6.2	6.2
300	1.8	2.5	3.0	3.4	3.7	4.0	4.5	4.9	5.2	5.4	5.5	5.6	5.7
350	1.6	2.3	2.8	3.1	3.5	3.7	4.2	4.5	4.8	5.0	5.1	5.2	5.2
400	1.5	2.1	2.6	2.9	3.2	3.5	3.9	4.2	4.5	4.7	4.8	4.9	4.9
450	1.4	2.0	2.4	2.8	3.1	3.3	3.7	4.0	4.2	4.4	4.5	4.6	4.6
500	1.4	1.9	2.3	2.6	2.9	3.1	3.5	3.8	4.0	4.2	4.3	4.4	4.4
550	1.3	1.8	2.2	2.5	2.8	3.0	3.3	3.6	3.8	4.0	4.1	4.2	4.2
600	1.2	1.7	2.1	2.4	2.6	2.9	3.2	3.5	3.7	3.8	3.9	4.0	4.0
650	1.2	1.7	2.0	2.3	2.5	2.7	3.1	3.3	3.5	3.7	3.8	3.8	3.8
700	1.2	1.6	2.0	2.2	2.5	2.6	3.0	3.2	3.4	3.5	3.6	3.7	3.7

Clearly the evaluation processes within SMILE were designed to be as accurate as practically possible at estimating the impacts that result from the demonstration projects. However, the implication of the formulae that control the confidence limits is that in order to get a tighter range of certainty around the quoted result a larger sample must be used upon which to base the result. The table also indicates that there is a law of diminishing returns in that increases in sample sizes produce a steadily smaller proportional improvement in accuracy for a given percentage result. Ultimately this had resource implications for SMILE partners, because collecting large data samples would significantly increase the cost of the evaluation process.

Hence we were faced with a compromise between the resources available and the need for an acceptable level of statistical accuracy. As a general rule we suggested that sample sizes were set to the maximum possible level within resource constraints and that partners aim for a minimum sample size of 300 and certainly no lower than 200.

Sample Size for Continuous Data Collection

Sample size for a mean value (from continuous data)

$$n = [(tS/d)^2]\ /\ [1 + (tS/d)^2/N]$$

where S^2 = variance of the population (from prior information or estimates/guesswork)

As previously, if the population is large, an approximation of the sample size is given by:

$n = (tS/d)^2$ which for a 95% confidence limit becomes:

$n = 3.84\ S^2 / d^2$ where d is a measure of the absolute uncertainty in the mean result

For example. If a city wishes to estimate the average journey time along a route during the peak period using number plate matching. From previous knowledge the journey usually takes about 12 minutes with a standard deviation of about 3 minutes. An accuracy of 4% is required for the mean value with a 95% confidence limit. Hence:

$d = (12.0 * 0.04) = 0.48$ minutes

thus $n = [1.96 * 3.0 / 0.48]^2 = 150$

In this example, the population may be regarded as very large (e.g. a flow of 10,000 vehicles over the period) so the approximation should hold true.

Data Collection Survey Methodology

For questionnaire surveys, the main methods of collecting information include face-to-face interviewing, telephone, mail, and internet. Each mode of the data collection has inherent advantages and disadvantages.

In-person data collection typically yields the most complete coverage, achieves the highest response rate, and produces the best quality data. Not surprisingly, in-person interviews are also the most expensive of the four modes. For this reason, telephone and mail modes are more commonly used despite well-recognized trade-off in data quality. Apart from high cost, other obstacles to personal interview include personal security, gated communities etc.

In a **telephone questionnaire**, respondents are called by survey teams to answer a series of questions which are recorded during the survey. It can cost a lot to set up the appropriate systems to conduct telephone surveys. Compare to postal questionnaire, telephone surveys can get higher response rates, so can be more representative of the population.

The main advantage of **postal questionnaires** is that they are cheap, and they can have a wide geographical distribution. However, postal questionnaires take a long time to send out and get back. Low response rates and uncompleted forms are common problems with such methods.

For data collection through the **internet**, respondents are asked to complete a questionnaire on-line, and the results are sent directly into a database allowing the survey team to access the response immediately. They are relative cheap to conduct. The problem with such methods is that the results may be biased to higher socio-economic groups and younger people who have access and miss out other groups.

Selection of an appropriate mode requires careful consideration of many factors, not the least of which is coverage of the target population. While the method of data collection might be largely dictated by the population coverage and sample frame, other common determinants include survey costs, response rates, and data quality issues. Mode selection can also be influenced by the complexity and length of the survey and timeliness needs.

Sampling Issues

In designing a questionnaire survey, it is easy to become over burdened by trying to generate a perfect random sample where as in reality a perfect random sample will never be achieved. Whilst measures can be taken to improve the random nature of the sample there will always be some people who will be more inclined to respond to a questionnaire than others. For example, retired people will have more spare time with which to 'get around' to filling in the questionnaire, or because it is quite an emotive issue those more concerned about transport issues will be more inclined to fill it in. Therefore, in some cases it is important to choose a sample size large enough to have enough respondents within certain sub-samples that are of particular interest to the measure in question (e.g. young people compared to old people).

It should be noted that the sample size equations assume a random sample (i.e. one group within the population has not responded disproportionably compared to another). Also, these sample sizes are the numbers required to be returned, and this can differ quite drastically depending on the subject of the questionnaire, incentives for reply and the target group. Local information on response rates from previous questionnaire surveys (which will depend on your survey method e.g. postal, email, face to face, handed out) can be very informative.

These considerations combine to emphasise that it is the experience of local site evaluation managers that will be crucial in understanding what is relevant and achievable within the prevailing local conditions that must determine the course of action appropriate for the administration of individual surveys.

Interim Data Collection and Analysis

For some indicators, particularly those which rely on large public surveys to get a picture of opinion in the before and after situations it may not be possible to build a picture of the interim situation as the project progresses. However, for many other indicators data collection was an ongoing activity for someone connected with the project. (Examples of this might include fuel consumption and patronage monitoring over a period of time.) In such cases it was considered good practice to periodically analyse the data because this enabled:

- the site evaluation manager to confirm that the data was actually available
- the site evaluation manager to check that the data was being collected as was specified (i.e. the values to the necessary detail)
- the measure leader to get some feedback regarding the performance of the measure, which could in turn allow potential problems with the measure to be identified and addressed before the demonstration period finished
- the demonstration manager to have some results to help publicise the interim impact of the project and so establish some momentum within local and trade press etc
- the site evaluation manager to set up the necessary data analysis tables and do some of the work during the course of the project, rather than leaving it all to the end and so unnecessarily adding to the inevitable analysis and reporting burden at the end of the project.

2.2.4 Analysis Techniques

The MAESTRO guidelines for monitoring and assessing transport pilot and demonstration projects proposed four main methods for processing the data gathered in order to provide an insight into the economic performance of the demonstrated measures. These methods are:

- Goal achievement
- Multi-criteria analysis
- Cost effectiveness analysis
- Cost benefit analysis

The first two methods in the list are designed to provide a flexible way of dealing with qualitative multidimensional effects of transport projects. These methods attempt to take into consideration the multiple impacts of a project in a balanced manner. Impacts are weighted depending on their relative importance or priority in terms of meeting the objectives of the measures being considered. These methods do not take into account the effectiveness of the measures in comparison to their costs, although they can include costs as one of the criteria by which the measure is judged.

The latter two methods are designed to provide a better insight into the relationship between the impacts of the demonstrated measures and their costs, with a view to not only providing an assessment of an individual measure but also to allow comparison of the effectiveness of alternative measures.

Given that one of the key aspects of the evaluation within the CIVITAS programme is the understanding of the value for money delivered by the European Commission's investment in the demonstration projects, it was logical that the assessment used either cost benefit or cost effectiveness analysis. An assessment of the two methods was conducted during the course of producing the SMILE Evaluation Plan and it was decided that cost effectiveness analysis was appropriate for analysis of the measures at the project level because we are interested in gaining a full understanding of how each measure manages to combine cost effectiveness with the achievement of a wide range of objectives rather than justifying the future implementation of a particular application in a specific location. In conjunction with this GUARD investigated whether, using the data collected at the measure level, it could conduct a more complete cost benefit analysis for selected measures in order to satisfy the Commission's requirements relating to the effectiveness of measures within each of the eight topic area headings.

In order to make such a cost effectiveness analysis possible the total cost associated with each measure had to be calculated. Discussions were conducted with GUARD regarding the exact details of the cost effectiveness calculation methodology to be used, in order to ensure consistent results across the SMILE measures and also across the CIVITAS II projects. Meanwhile discussion with the site evaluation managers indicated that the total cost of each measure should not be regarded as an indicator, as it not in itself a measure of the performance of the measure. Instead it was decided that it should be listed as a separate, compulsory item to be determined for each measure.

Cumulative Effects Assessment (CEA) Methodology

"Cumulative" effects (or impacts) is an expression used in both planning and evaluation to refer to the effects which derive from the combined impact of a particular measure and/or combinations of measures, taking account of the 'baseline' data in each city and set within agreed geographic boundaries and timescales. This is illustrated simply in Figure 2.4:

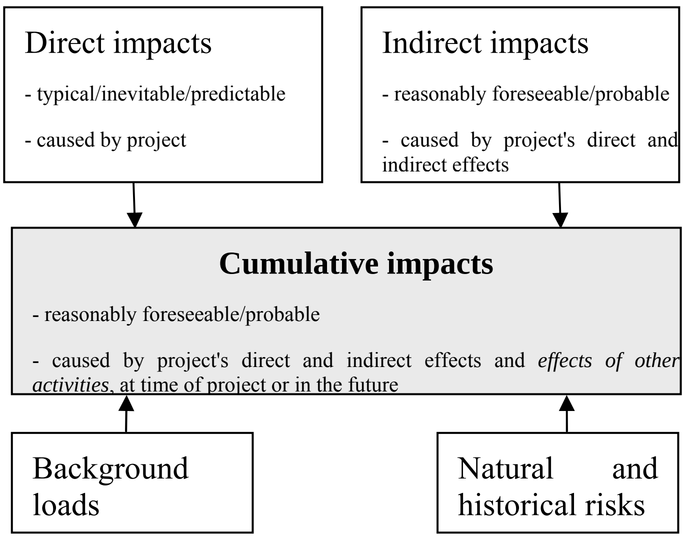


Figure 2.4: Diagram showing what cumulative effects entail (INTERNAT, 2001; TRB, 2002; Beale, 1993)

An example of this might be given by considering the health effects of a person changing mode from the car to walking for a particular short journey. The direct benefit that would generally be taken into account would be the additional exercise experienced by this person. However, there are at least two other secondary benefits that could also be taken into account:

1. by changing mode the total pollutant emissions in the region of this journey will be reduced by virtue of the fact that a car trip has not been made;

2. the pollution levels experienced by pedestrians have been shown to be less on average than those experienced by people travelling by car.

A cumulative effects assessment would attempt to take all these aspects into account, not usually at the individual level, but at the district or city level.

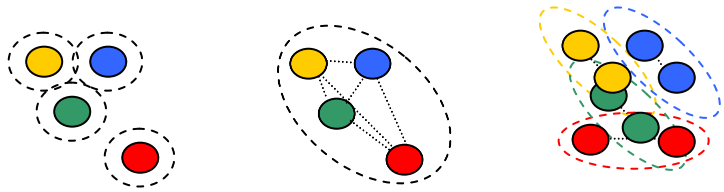
GUARD set out the need for evaluation across the areas of economy, energy, environment, society and transport, as reflected in the table of standard indicators (table 3.1) and this was interpreted four levels of analysis which were put forward to be used in the technical evaluation, as follows:

1. The likely evolution of the baseline situation as if no measures has been put into place. This will be developed using the business as usual (BAU) scenario.
2. Cumulative effects on a measure by measure basis. This took each measure and brought together the individual indicators to give an overall evaluation of each measure, taking into account any interactions that existed between the impacts, as expressed in the example above.
3. Cumulative effects across the city region. This looked at the packages of measures implemented in each individual SMILE city and, within agreed geographic boundaries and timescales, combined the outcomes of these measures in terms of the overall impact on selected indicators across the city region (including baseline data).
4. Scaling up of measures. This was an *ex ante* approach which was used to predict the effects of 'upscaling' (i.e. rolling out or extending the schemes already implemented) on specific indicators across other parts of each city.

The latter two levels of analysis used techniques such as causal chain (or network) analysis, GIS and expert judgement (through interviews) of the likely sites, character and effects of extending or implementing the measures, again over specified spatial and temporal horizons.

From these analyses, it was expected that SMILE would gain an understanding of the cumulative effects of the measures implemented in each city region.

Plan view of measures (filled circles) and impact boundaries (dashed lines)



i) ii) iii)

Measures:	Separate	Combined	Upscaled
Impacts:	Separate	Separate and Combined	Separate and Combined

Figure 2.5: Types of CEA evaluation scenarios associated with SMILE measures. 'Separate' (single) means measures/indicator issues analysed separately. 'Combined' (multiple) means measures/indicator issues combined across a city

Transferability

Although a measure may prove to be successful in one situation, the same measure may not prove successful in another. Thus, it is vital for anyone who wants to replicate a measure in a different context to assess the critical factors that influenced the success of the original measure. Therefore, in terms of evaluation, transferability is concerned with assessing the extent to which the demonstrated measure would achieve the desired result in other circumstances.

The cumulative effects assessment has assisted greatly in the analysis of the potential for transferability and maximising the benefits of measures within the individual SMILE cities. However, the SMILE measures also need to be assessed in terms of their appropriateness for transfer to other locations. In order to judge the potential for the transferability of any transport measure, it is necessary to consider the basic characteristics of the cities involved and the different circumstances in which the policies were implemented. A range of contextual markers are relevant to guide the assessment of measure transferability between cities in this way:

- Site /technology requirements: A number of types of solution will be required in different cities depending on the state of development of technology within the local market. This would place different demands upon the support infrastructure and sites needed for the systems.
- Implementation problems: lack of labour resources, low levels of political support and unfamiliarity with technology are all problems that can frequently arise during the implementation of demonstration projects.
- Institutional barriers: The organisational structure in place can have a significant impact on the format of a demonstration in terms of the partners required, the ease of implementation, the availability of data and the ability to release results. Examples of how such issues can influence demonstrations include:
  - Local elections and changes of administration
  - Opposition from local residents and / or traders
  - Legal obstacles
  - Split responsibilities within different departments of the same organisation
- The extent of deregulation – a highly regulated structure may prove difficult to change by introduction of innovative measures, but also may be able to provide significant amounts of data without extra monitoring. In contrast, deregulation may make it easier to introduce innovation, but commercial sensitivity may make access to data for evaluation and release of project results more difficult.
- The split of responsibility – in the urban sector there is frequently an overlap of responsibility between local political authority and a local transport authority. The amount of overlap, the specific responsibilities of the two organisations and how cordial the relationship is between the two can have a significant impact on the ease of implementation and evaluation.
- Socio-economic and cultural barriers: Income, car ownership or inherent acceptance of using certain modes can all have an impact on the success of new transport schemes.

This list has been developed and enhanced by GUARD as it considered the issue of transferability of results, leading to the development of an understanding of the barriers and recommendations for the transferability of the measures.

The ultimate assessment of transferability of measures and their potential impacts between cities is the responsibility of GUARD based upon information collected and collated at the project level for all the CIVITAS projects. The relevant information for the SMILE measures is presented later in this evaluation report in the form of a transferability assessment for each measure following a template developed by GUARD.

2.2.5 Reporting Templates

A common reporting framework in the form of templates was developed in CIVITAS I. That template was considered by GUARD and the individual CIVITAS projects and modified slightly to reflect the updated practice agreed for the CIVITAS II evaluation, as shown in the following tables. The information required in sections A & B is closely related to the overall project management and implementation process information used for the collation of the management reports and process evaluation data collection. Section C is where the core of the technical evaluation is reported. Section D provides the opportunity to record process evaluation information, which could be reported by the measure / site manager separately to the information delivered to GUARD through its project database, although the database information was then available to supplement the information provided directly.

A Introduction

A1 Objectives

The measure objectives are:

- Objective 1
- Objective 2

A2 Description

B Measure implementation

B1 Innovative aspects

Select one or more innovative aspects from the list below, then describe each in more detail with a few sentences:

Innovative Aspects:

- New conceptual approach
- Use of new technology/ITS
- New mode of transport exploited
- Targeting specific user groups
- New economic instrument
- New policy instrument
- New organisational arrangements or relationships
- New physical infrastructure solutions
- Other – please describe

The innovative aspects of the measure are:

- Innovative aspect 1
- Innovative aspect 2

B2 Situation before CIVITAS

B3 Actual implementation of the measure

The measure was implemented in the following stages:

Stage 1:

Stage 2:

Where possible include diagrams and maps to aid understanding.

B4 Deviations from the original plan

The deviations from the original plan comprised:

- Deviation 1 title
- Deviation 2 title

B5 Inter-relationships with other measures

The measure is related to other measures as follows:

- Measure 1
- Measure 2

C Evaluation – methodology and results

C1 Measurement methodology

C1.1 Impacts and Indicators

Table of Indicators. *Insert own table where available, use landscape layout as necessary*

No.	Impact	Indicator	Used	Etc..
	Table text Table text Table text	Table text Table text Table text Table text		

Detailed description of the indicator methodologies:

- Indicator 1 (Name of indicator)
- Indicator 2 (Name of indicator)

C1.2 Establishing a baseline

C1.3 Building the business-as-usual scenario

C2 Measure results

C2.1 Economy

C2.2 Energy

C2.3 Environment

C2.4 Transport

C2.5 Society

C3 Achievement of quantifiable targets

No.	Target	Rating
1		
2		
3		
4		
NA = Not Assessed 0 = Not achieved ★ = Substantially achieved (> 50%)		
★★= Achieved in full ★★★= Exceeded		

C4 Up-scaling of results

C5 Appraisal of evaluation approach

C6 Summary of evaluation results

The key results are as follows:

- Key result 1
- Key result 2

D Lessons learned

D1 Barriers and drivers

D1.1 Barriers

- Barrier 1
- Barrier 2

D1.2 Drivers

- Driver 1
- Driver 2

D2 Participation of stakeholders

- Stakeholder 1
- Stakeholder 2

D3 Recommendations

- Recommendation 1
- Recommendation 2

D4 Future activities relating to the measure

2.3 Process Evaluation

This section explains the outline of the process evaluation in generic form as it has been closely allied to the activities of GUARD, particularly as GUARD invested significant effort in developing a process evaluation data collection tool which has been used extensively at the project level as well as for programme level process evaluation.

2.3.1 Introduction

Success of the CIVITAS measures has been influenced not only by the technical solutions themselves, but also by optimising the process of planning and implementation, including accompanying activities such as information, communication and engagement of stakeholders. During the initial stages of planning and preparing a transport measure, it is important to establish the constraints and context within which the project is designed and implemented. Providing the institutional framework allows, this should result in a well prepared project implementation process.

The goals of the process evaluation within the CIVITAS programme, as defined by GUARD, were:

- to offer an on-line feedback and helpline to assist in overcoming unexpected barriers, and
- to establish success factors and strategies to overcome possible barriers during the implementation phase of the CIVITAS measures by a cross-site analysis.

This was expected to lead to a "win-win" situation for the representatives of the individual CIVITAS II projects, such as SMILE, and for the GUARD project.

The goals of the process evaluation place great emphasis on the identification of the potential driving forces that could help in delivering a successful measure, as well as the barriers, which could have led to a serious delay in the implementation of the measure or even to its failure or cancellation. These barriers may have been due to technical, political, institutional or other problems at the local or national level. Conflicting interests between project partners, or with external stakeholders, may have led to management and communication problems. Understanding the objectives and concerns of stakeholders can help to identify such issues at an early stage, or even avoid them. Once the planning and preparation process has begun, well designed process monitoring should assist in identifying barriers.

Within CIVITAS II process evaluation was scheduled to occur both within the individual projects and at the level of the overall CIVITAS programme:

- At the programme level the process evaluation was co-ordinated by GUARD, with data being collected from within each project.
- At the project level analysis of the process evaluation data has been conducted at the measure level.

2.3.2 Conduct of the Process Evaluation

GUARD developed a framework for the collection of the information needed for the process evaluation based around a standard online data collection template and an associated procedure to be followed by all four CIVITAS II projects. The data collection for the process evaluation was co-ordinated by GUARD and organised in close collaboration with the SMILE evaluation team (evaluation co-ordinator, site evaluation managers and site managers). This was an interactive process with contact being established directly with the relevant contact persons responsible for the individual measures (where there is no barrier to this dialogue being conducted in English). Regular liaison continued during the life time of the project.

GUARD's collection of the process evaluation information was based around five connected methods, centred around the online data collection template:

- Initial questionnaire (basis for the process diary) for each measure or bundle of measures considering preliminary information from the measure description. (This was in effect a confirmation that the starting point was still close to that laid out in the original proposal);
- Process diary to be filled in regularly according to the life cycle of the measure and to be sent to GUARD by the responsible contact person or the evaluation manager;
- Contacts from GUARD to the measure contact persons by phone or e-mail where clarification of information in the process diary is required;
- Feedback information from GUARD to the measure contact persons via the evaluation manager with recommendations for a successful implementation of measures, if requested;
- Contact persons at GUARD for possible inquiries concerning the implementation process are available during the project's life time.

At the project level, analysis of the process evaluation data has been conducted for each measure in order to maximise the value from the impact evaluation. This has been done primarily by extracting from the GUARD database the key elements of the process evaluation data provided by the measure leaders for analysis and reporting within the measure-level reporting template (see section 2.2.5). In co-operation with GUARD arrangements were made to conduct process evaluation workshops with SMILE measure leaders towards the end of the project. This involved an initial scoping workshop for those measure leaders present at the SMILE consortium meeting to be held in Norwich in April 2007 and then more detailed workshops in each site during 2008 in co-operation with the dissemination workpackage.

Figure 2.6 shows the structure of the process evaluation activities and the communication structure.

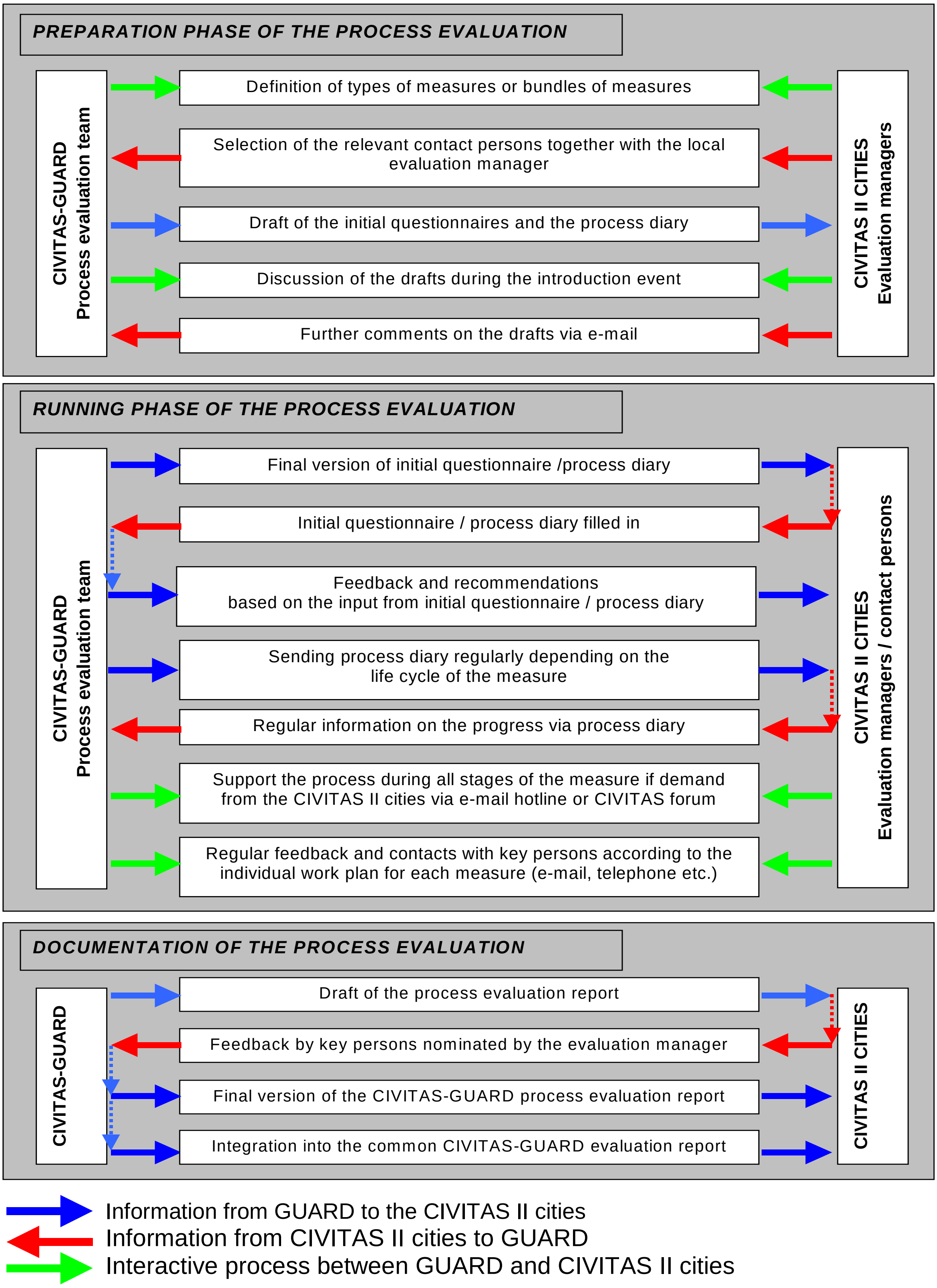


Figure 2.6: Detailed description of the procedure of the implementation process evaluation

2.3.3 Content of the Process Evaluation

The process evaluation focused on two subjects:

- the overall project management of all stages of the measure and
- engagement activities accompanying the measure.

Within both subjects, a number of topics were addressed as shown in table 2.5. They were initially developed into the form of a questionnaire which GUARD subsequently converted into the online data collection template for easier recording of information. Information that is already available within the description of work for each measure has been collected from source by GUARD in order to reduce the burden on the SMILE contacts.

The programme level process evaluation is dependent upon data collection at the measure level. Subsequent cross-site analysis will be carried out according to the different topic area headings defined for the demonstration measures (i.e. clean vehicles, access restrictions etc.). Accompanying activities have been taken into account as well (Figure 2.7). Synergy effects between the individual measures might have led to the analysis of a bundle of measures, where appropriate (Figure 2.8). The process evaluation also included influences at the city level such as the local and regional frameworks (financial, legal, cultural and institutional) of the cities.

Table 2.5: Overview on the contents of the process evaluation

Progress of the measure	Project management	Engagement activities
Planning, preparation and design phase	Preparing for project Management - Objectives and work plan, necessary formal decisions - Developing an organisational structure - Management of information - Quality management Establishing the project management team (including responsibilities) - Measure manager - Measure management team - External consultant - Measure champion Managing resources - Time schedule - Skills - Costs for all activities and the measure	Engagement strategy - Preparing an engagement strategy and defining the objectives and key issues to be addressed - Identifying stakeholders and their knowledge and attitudes - Managing the engagement process Media strategy (including time schedule) - Feature article - Press releases and news conferences - Press pack Marketing strategy - Institutional marketing - Information and image campaigns - Awareness campaigns - Individualised marketing
Implementation phase of the measure	Overcoming barriers - Institutional / Legal / Financial - Management barriers - Internal communication barriers Project monitoring - Measuring process indicators - Tracking progress (deviation and revision of the measure plans) - Data collection and data storage	Managing Stakeholder involvement - Elected officials - The media - Special interest groups - Opponents - External expert advisors Managing the engagement process - Issues for engagement - Managing outputs - Third party mediation & negotiation
First phase of operation of the measure	To be surveyed in co-operation with the technical evaluation	

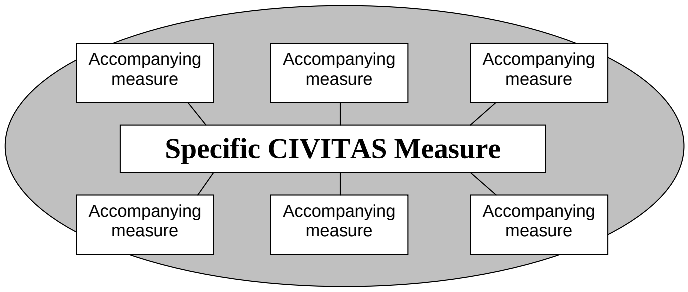


Figure 2.7: Process evaluation on measure level considering accompanying measures

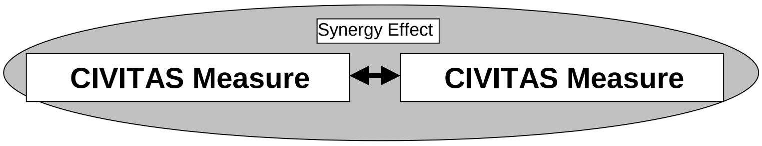


Figure 2.8: Process evaluation on measure level considering synergy effects between different CIVITAS II measures of a city

The process evaluation dealt with the evaluation of the process following the steps of the implementation of transportation measures:

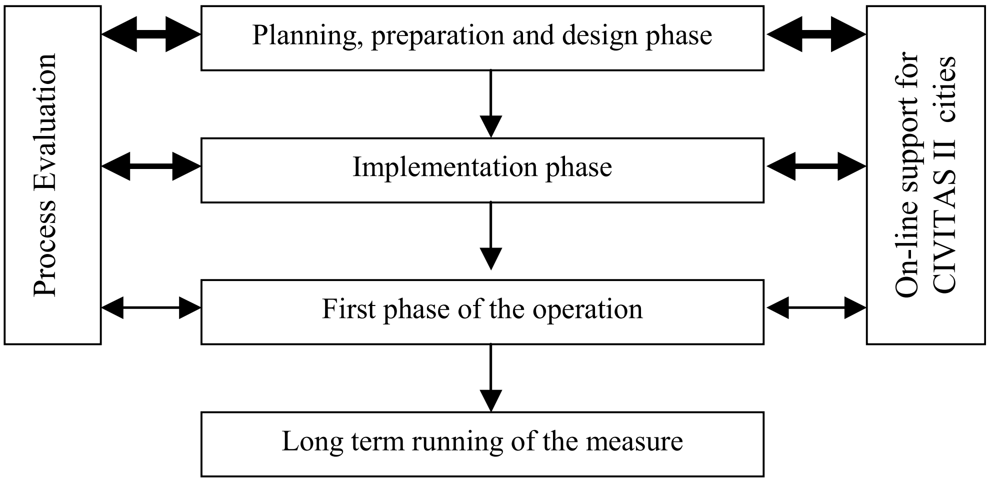


Figure 2.9: Life cycle of transport measures and relation to the process evaluation in CIVITAS II

However, the main focus was on the initial phases of the measure (planning, preparation and design phase) as good preparation of measures is the basis for a successful outcome.

2.3.4 Documentation of the Process Evaluation

It is clear that the relation between the results of the technical evaluation and process evaluation is an important part of analysis that has been conducted at both the project and programme levels.

The project-level reporting of the process evaluation has been based around sections D1 to D4 of the measure-level reporting template (see section 2.2.5) which formed the basis for subsequent analysis.

At the programme level the outcome of the process evaluation will be a comprehensive report on the types of measures and their implementation processes, factors of success for each type of measure and typical barriers during the implementation, including promising strategies for how to prevent or overcome them. For each element considered in the process evaluation GUARD is developing an assessment scale to quantify the level of success and to justify a substantial commitment of resources and public involvement aside from technical planning or project engineering. Sensitive information will be presented in an anonymous form. Although the process evaluation uses mainly qualitative indicators, some quantitative indicators will be developed to enable a cross-site comparison. Finally, an overall report will be produced including the results of both the technical and the process evaluation cross-site comparisons - the CIVITAS-GUARD process evaluation report.

Process Evaluation Workshop Topic Guide

Workshop Structure

1. Welcome and Introduction

   Required to provide the context and explain the structure of the workshop.

2. Project Initiation Phase

   Who initiated?

   Why them?

   Why did they do it? i.e. what did they want to achieve?

3. Project Planning Phase

   Who led? Same as initiator, or different? Why?

   Who else involved? At what stage did other people / organisations get involved?

   Was the measure driven forward by someone or did it evolve out of consensus?

   At what stage was a budget drawn up?

   At the time did you feel it was well planned?

   Looking back, could it have been better planned? How?

   Were there national / local laws which helped you do this?

   Were there national / local laws which made it hard for you do this?

   Were there choices between different technologies and if so what moved you towards some technologies and away from others (besides price)? Convenience? Familiarity with similar technology? Readily available versus forecast maturity in coming years?

   Were there existing relations with other organisations that helped or hindered this?

4. Project Implementation Phase

   Who led? Same as planner, or different? Why?

   Were extra people / organisations needed at this stage? Who? Why?

   Were some people / organisations no longer needed at this stage? Who? Why?

   Was a budget revision needed?

   Did the project plans need to be changed at all? Why?

   What went well? What went badly? Why?

   Were there national / local laws which helped you do this?

Were there national / local laws which made it hard for you do this?

Were there choices between different technologies and if so what moved you towards some technologies and away from others (besides price)? Convenience? Familiarity with similar technology? Readily available versus forecast maturity in coming years?

Were there existing relations with other organisations that helped or hindered this?

5. Project Operation Phase

Who operated? Same as implementer, or different? Why?

Were extra people / organisations needed at this stage? Who? Why?

Were some people / organisations no longer needed at this stage? Who? Why?

Was a budget revision needed?

Did the project plans need to be changed at all? Why?

What went well? What went badly? Why?

Were there national / local laws which helped you do this?

Were there national / local laws which made it hard for you do this?

Were there choices between different technologies and if so what moved you towards some technologies and away from others (besides price)? Convenience? Familiarity with similar technology? Readily available versus forecast maturity in coming years?

Were there existing relations with other organisations that helped or hindered this?

6. Overall

Looking back, what, if anything, would you differently?

Would you have got anyone else involved? Who? Why?

Would you rather someone hadn't got involved? Who? Why?

Would you have managed the budget the same way?

What have you in general learned from this entire process?

Even if there have been failures or delays, did these failures and delays lead to other kinds of success or positive learning experiences? If yes, what?

At each stage it would be good to identify the following:

	Barriers	Critical Success Factors
Political		
Financial		
Technical		
Participation		

Upscaling / Exploitation / Transferability

Is there scope to implement the measure more widely?

- within existing organisational framework / project area
- or over a larger geographical area

What would be technically possible by end of SMILE?

What would be practically possible by end of SMILE?

Will this happen by end of SMILE? Why / why not?

To what extent would the measure/activities you worked with have occurred without SMILE funding? i.e. would you have tried to do this anyway and obtained funding from elsewhere thus meaning other measures/activities would have been delayed or was SMILE funding a 100% prerequisite for the measure/activity? Or was it that SMILE-funding speeded up actions that might have otherwise first occurred in coming years?

Where do you think your measure/activities will be in January 2010 i.e. one year after SMILE is over.

What is practically possible by 2015? Do you think this will happen? Why / why not?

What could be done to help it happen?

Should this measure be promoted elsewhere / more widely? Why / why not?

Do you think it would be easy to make it happen elsewhere / more widely? Why / why not?

Is there something which threatens the long term success of the measure? (This could be a development external to SMILE which is unfavourable to the specific SMILE measure.)

Is there some alternative to the measure now possible/available which may come to replace/supplement the measure?

3 Summary of Evaluation Results for Each Measure

This chapter presents a summary of the evaluation results on a measure by measure basis. The presentation of results is grouped on a city by city basis. For each measure the summary of the results taken from the full evaluation template is followed by a summary of / the whole of each measure's transferability assessment and for most but not all of the measures a cost effectiveness assessment. The full evaluation templates for all measures are available as annexes to this report.

3.1 Malmo

3.1.1 Measure 5.1: Clean Municipal Fleet

This measure concerned the intention to make many municipally-owned or leased light vehicles in the City of Malmö clean by the end of SMILE and the resultant effects of this change.

Liked to this was an expectation that there would be a demonstration effect to the general public as the vehicles were clearly marked as environmental vehicles and highly visible during daytime in the traffic in Malmö

Key Results

- 313 clean light vehicles were procured up to and including month 43 which means that the goal of procuring 250 clean light vehicles was exceeded by a wide margin. The City of Malmö has approximately 630 light vehicles as of the end of September 2008 which means that, together with clean vehicles still in use from prior to SMILE, about 65% of all City cars, vans, mini-buses and light trucks can be considered clean. This means that the goal of 100% clean vehicles was not attainted before the end of SMILE. In all likelihood the goal of 100% clean vehicles will never be achieved completely (because of there being no car models available to fit certain special needs) but for all practical purposes can be considered to be reached during 2011 or 2012, depending on the continuation of current procurement trends .
- The most important part of the measure, the demonstration effect, cannot be found. In part, the absence of a measurable demonstration effect may be the result of factors external to SMILE, i.e. extensive media coverage of climate and environmental concerns, the 10 000 SEK rebate on environmental cars, etc.
- Reductions in emissions as the result of the measure were approximately the following (expressed as both absolute levels and per vkm):
  - CO_2: Reductions ranging from 92834 to 241776 kg/year or between 7.3 to 19 grams/vkm
  - NOx: Reductions ranging from 24 to 32 kg/year or between 1.9 to 2.5 milligrams/vkm
  - PM_{10}: Reductions on the order of approximately 1.4-1.5 kg/year or between 0.11-0.12 milligrams/vkm
- Awareness and acceptance (without the demonstration effect) were improved during the measure.

- This measure has led to significant changes in the composition of the municipal fleet and has clearly put the City of Malmö on course for a 100% clean fleet during the start of the next decade. However this has been achieved, in part, through factors external to the measure.

Recommendations

- Recommendation 1 – That the implementation of the measure should be carefully planned and the objectives properly formulated in a quantified form. It would have simplified and made the evaluation process easier if an employee at VISAB had been appointed the measure leader and thus the principle contact. (Administrative tasks linked to the EC project element, that might have been overwhelming at times for VISAB, could have been shouldered by either the Dept of Environment or Department of Streets and Parks as appropriate.)
- Recommendation 2 – In applications of the type like SMILE and in everyday city administration business/projects, the objectives must be more quantified in terms of amounts, geographic scope and deadlines. Further that these objectives should have clear « owners » that also have been provided with at least a general description of how the objectives can be practically achieved. Therefore, to gauge the success of a measure its objectives need to be tangible, achievable and measurable and not simply set as statements. It is recommended that the objectives are properly researched prior the start of the project to meet the project requirements and enable the evaluation process to correctly measure their achievements and overall success of the project.
- Recommendation 3 – The demonstration effect that was the key focus in the original DMP has been hard to find and may have been a very tenuous relationship. Future projects should be very cautious about funding changes in the types of vehicles private people owned based solely on an indirect approach and should instead more directly influence the choices, habits and possibilities for car owners. Alternatively a measure that seeks to change vehicle ownership should have more direct effects at the centre of a list of measure objectives and implementation where the objectives are quantifiable and with a clear timetable.
- Recommendation 4 - At some point diminishing effects from the procurement of primarily clean vehicles will start to occur. For NOx emissions, as discussed in C2.3 and D4, this point occurs sometime between month 43 and one year after the conclusion of SMILE (month 60) at which point in time NOx emissions per vkm begin to rise. This means that while continuing to reduce CO_2 emissions per vkm and keeping PM_{10} emissions per vkm essentially steady, this measure will not help reduce NOx emissions from the fleet in the long run. This means that the City might consider one or more of the several options below:
  - A. Shift procurement habits towards vehicles with both lower CO_2 and NOx emissions per kilometre.
  - B. Consider new ways for city employees to execute their tasks and jobs in ways that require less total transport, this reducing the total travel work for each vehicle in use.
  - C. Reorganise city administration so that the need for travel decreases.
  - D. Have a program in place so that all city employees regularly take refresher eco-driving courses/instruction to reduce fuel consumption and thereby reduce NOx emissions from the fleet.
  - E. Have a mechanism in place to reduce use of fleet vehicles for non-job trips (if this is a problem…).
  - F. Seek to reduce emissions of NOx from traffic that is not part of the City fleet.
- Recommendation 5 – to increase awareness and acceptance amongst the inhabitants of Malmo expectations of the effects of local demonstrations could be supplemented by a marketing campaigns and activities to promote clean vehicles and their benefits.

- Recommendation 6 – high level of procurement which has occurred should be used to market this measure to other governmental and private organisations, especially in relation to Objective 1 of Measure 9.1.

Transferability

This measure has potential for transferability where authorities have resources and ability to introduce clean vehicles for use for their employees. Promotion of environmental benefits can help raise awareness of such schemes amongst the authorities, employees and general public.

Components relevant to transferability of measure 5.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Services Offered				
	Procurement of 250 clean vehicles	High	0	The goal is that the City of Malmö will procure 250 bio fuel and gas vehicles of different types for their municipal car fleet for their employees to use. This characteristic doesn't necessarily classify as service but it is the main objective of the measure. Transferability exists where authorities plan to adopt similar measures to reduce emissions and have resources to do so. It may also be worth exploring opportunities for funding arrangements similar to CIVITAS project.
Target Population				
	City of Malmo employees	High	0	The main target population for this measure is the employees of the city of Malmö. Instead of using their own private cars when on duty or otherwise at work employees will instead use the clean city-owned vehicles for all work-related personnel and light freight transport. The employees are discouraged from using private cars when travelling to work since they are not allowed to use these vehicles on duty. Transferability potential exists where there is willingness amongst municipal authorities to introduce such activities and encourage their employees to use clean vehicles and where employees themselves recognise the benefits of using clean vehicles in their everyday duties.
	Private users	High	0	The second group of target population are the inhabitants of the city of Malmö. The use of these vehicles is highly visible, through markings and slogans on the cars, and this will mean that citizens and present car drivers in Malmö will see these cars on a daily basis. With coordinated market approach to raise awareness levels amongst the general public this characteristic has potential for transferability.
Geographical Area Covered				
	City of Malmö	High	1	This measure has been implemented in the entire city of Malmo.

Components relevant to transferability of measure 5.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				This characteristic is transferable to any city and authority able and willing to promote the usage of clean vehicles and where there are resources available to introduce such measures.
Finances				
	Costs	High	2	Costs are associated with procurement of vehicles, personnel, information material and marketing activities. This characteristic is transferable where there are resources available as there will be costs associated with introduction of such measures. It may worth for cities which plan such scheme seeking funding similar to SMILE project.
Stakeholders' Involvement				
	Miljöförvaltningen (Environment Department) City of Malmö	High	0	Environmental department has a leading role in implementing the measure, communication with stakeholders and dissemination of results to the public. Transferability can be achieved where there are authorities and organisations which are able and willing to introduce such measure.
	Gatukontoret (Streets and Roads Department), City of Malmö	High	0	Gatukontoret is an occasional participant which offers support with marketing activities. Transferability can be achieved where there are authorities and organisations which are able and willing to introduce such support services in similar context.
	VISAB	High	0	VISAB, a City-owned company, buys or leases vehicles for the City at competitive prices based on various agreements with each department and its requirement. Transferability exists as a concept of procuring clean vehicles. When planning similar projects the cities need to adhere to their specific procurement policies. The supplier of clean vehicles also needs to be available.

Components relevant to transferability of measure 5.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Legal or contractual Requirements				
	Contracts	High	1	Contracts would have been set up between City of Malmo departments and VISAB for procurement services. Transferability exists where such contractual arrangements need to be in place for successful running of the project.
Technical Requirements				
	Clean vehicles	High	0	This measure involves procurement of all new vehicles to be clean vehicles for usage by municipal employees. Transferability has potential where suppliers of clean vehicles exist and where authorities and organisations are willing and able to introduce such measures.
Implementation and Management Aspects				
	Management	High	-1	Rapid turnover of measure leaders during first 12-18 months meant no continuity and no implementation in a meaningful way. Information and experience transfer lagged or was poor between measure leaders at key points in the implementation of the measure. Transferability is not appropriate where similar managerial issues can affect implementation and evaluation of the measure. For the measure to be successful it is imperative that all staff are loyal and dedicated to the project and that the correct project management procedure are in place.
Awareness and Communications				
	Awareness and acceptance	High	0	The demonstration effect is the most important aspect of the activity; the vehicles have been clearly marked as environmental vehicles and highly visible during

Components relevant to transferability of measure 5.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				daytime in the traffic in Malmö which means that citizens and present car drivers in Malmö will see these cars on a daily basis. To increase awareness and acceptance amongst the inhabitants of Malmo expectations of the effects of local demonstrations could be supplemented by marketing campaigns and activities to promote clean vehicles and their benefits. This is something which can be considered when assessing transferability potential. Transferability has a potential where well planned marketing and consultation exercises can raise the level of awareness and acceptance amongst population.
Wider Issues				
	Wider application of the measure	Medium	0	High level of procurement which has occurred could be used to promote this measure to other governmental and private organisations. This needs to be complemented by a good marketing approach to ensure raising awareness and acceptance amongst wider population and promotion of the usage of clean vehicles and all its associated benefits. Transferability exists where authorities and businesses have resources to introduce and implement such measures and recognise their wider benefits.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration:	6 years				
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	1,568,990	412,800	0	-1,981,790	-1,981,790
Year 2	1,725,810	45,406	0	-1,771,216	-3,753,006
Year 3	3,959,820	12,590	0	-3,972,410	-7,725,416
Year 4	2,547,000	12,000	0	-2,559,000	-10,284,416
Year 5	0	0	0	-2,559,000	-10,284,416
Year 6	0	0	0	-2,559,000	-10,284,416
Total	9801620	482796	0	-10,284,416	
NPV	8918089	463040	0	-9381129	
Average net present annual cost				-1563521	

Adjusted to Euros, allowing for purchasing parity conversions					
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	
Total	877424	43219	0	-920643	
NPV	798332	41451	0	-839783	
Average net present annual cost				-139964	139964

Cost effectiveness assessment of this measure is complicated by the range of impacts attributed to the measure according to which extreme bound of the businesses as usual scenario is considered and the fact that this measure effectively speeds up purchase of the most environmentally friendly vehicles. Once the vehicles are purchased and hence in the municipal system then there is a relative benefit associated with their presence, although that relative benefit decreases over time as ‘standard’ vehicle technology improves so that ‘clean’ vehicles purchased say 3 years previously represent less of a benefit compared with further replacement.

Given this situation the best approach has been judged to be to use the annualised investment calculated in the table above and the annual emissions savings as follows to provide the cost effectiveness values.

The annual impact on pollutant emissions in 2008 from the purchase of clean vehicles by City of Malmö was as follows:

CO_2: reduction of between 92.8 and 241.8 tonnes

NOx: reduction of between 24 and 32 kg

Particulates: reduction of between 1.4 and 1.5 kg

Converting these values to cost effectiveness values gives the following ranges:

CO_2: SEK 6466 – 16848 per tonne or € 579 - 1775 per tonne

NOx: SEK 48.9 – 65.1 per g or € 4.4 – 5.8 per g

Particulates: SEK 1043 – 1117 per g or € 93.3 - 100 per g

3.1.2 Measure 5.2: Biogas on the Net

The sewage water treatment plants in Malmö produce large amounts of biogas which can be upgraded to vehicle fuel or natural gas quality. The goal of this measure was to establish a capacity to upgrade and put biogas onto the existing natural gas grid in Malmö, to start and operate two fuelling stations for biogas, and to ensure that an increasing percentage of the biogas made available is sold as biogas and not simply put out onto the net as natural gas.

This would mean that biogas in Malmö could be used in clean vehicles while at the same time reducing the net CO_2 emissions from transport in and around the city. E.on negotiated with the larger of the two city-owned sewage treatment plants Sjölunda for the purchase of gas from the swage treatment process.

Key Results

Summary of key evaluation results:

- E.on has established a local biogas injection to the grid through purchase of raw biogas from Sjölunda and the establishment of an upgrade facility. This has lead to the introduction of 10 GWh biogas to the local transportation system that otherwise would have been met in part by biogas produced elsewhere or by natural gas.
- E.on has established a vehicle gas fuelling facility in Ystad, some 60 km away from Malmö where no vehicles could be fuelled with natural gas or vehicle gas before. This has provided a much needed infrastructure for the expansion of use of gas powered-vehicles in this area. However, the effects on Malmö as the result of this part of the measure are negligible.
- E.on has established a slow-filling fuel gas facility for heavy vehicles to be fuelled overnight. This was a much needed improvement in fuelling infrastructure in Malmö. However this facility as finally built was not as large as original planned.
- This measure has led to the reduction of 430 920 kg CO_2 being emitted by vehicles in Malmö and the surrounding areas. That this reduction was not higher is because of allocation of some of the CO_2 reduction to other measures in Malmö where the biogas was used in vehicles and that production of biogas elsewhere in Sweden added so much biogas in the business as usual scenario.

Recommendations

- Recommendation 1 – It is recommended to establish more fuelling stations in Malmo and perhaps a further overnight slow filling station in the harbour areas or close to companies which may switch to gas vehicles.
- Recommendation 2 – To increase availability more gas can be produced for distribution from sources in Malmo.
- Recommendation 3 – To support existing filling stations in Malmo, where demand is concentrated, to supply biogas to potential clean vehicle owners thus increasing biogas availability in more locations.

- Recommendation 4 – Marketing campaigns to promote availability of vehicle gas and switching to clean vehicles at strategic locations such as filling stations, vehicle suppliers and relevant professional magazines.

Transferability

Environmental questions and particularly emissions from traffic contributing to climate change are important to address at the moment. According to measure implementation upgrading biogas to natural gas quality and integrating it to existing energy systems has a high degree of transferability to other European cities. Marketing campaigns can promote availability of vehicle gas and switching to clean vehicles at strategic locations such as filling stations, vehicle suppliers and relevant professional magazines. A range of technical and regulatory barriers have been overcome during the course of the past 4 years, which provides hope to other locations where such barriers remain.

Components relevant to transferability of measure 5.2	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Services Offered				
	Open and operate several fuelling stations for vehicle gas	High	1	There is good availability of biogas from sewage water treatment plants in Malmo which can be upgraded to vehicle fuel or natural gas quality. The original goal of this measure is to establish a capacity to upgrade and put biogas onto the existing natural gas grid in Malmö, to start and operate two fuelling stations for biogas, and to ensure that an increasing percentage of the biogas made available is sold as biogas. According to measure implementation upgrading biogas to natural gas quality and integrating it to existing energy systems has a high degree of transferability to other European cities. Making the utilization of biogas as part of gas fuelling is easier and more acceptable for regular car and lorry users.
Target Population				
	Car drivers Regional transport authority	High	1	Car drivers and regional bus operator are seen to be in strong support of the measure. Transferability has potential where biogas is available for commercial and private use and where there is support amongst people to use alternative fuels for environmental benefits.
Geographical Area Covered				
	City of Malmö and its surroundings	High	1	It is an objective to open and operate several fuelling stations for vehicle gas of which one will be dedicated to commercial uses with a slow, overnight, filling process and one which is open to all users with a fast filling capacity. This characteristic is transferable to any city where there are resources available to introduce such service.
Finances				
	Operating Costs	High	1	Estimated total costs for entire SMILE period: 27.4 million SEK. The original budget was 23.2 million SEK. The sub-projects “Sjölunda upgrade station” and “Ystad” proved more expensive. This is because transport of gas by road in

Components relevant to transferability of measure 5.2	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				containers with a mobile compressor would have not been included in the original plans for an additional filling station in Malmö itself. The slow-fuelling station in Malmö turned out to be less expensive since it was built with a smaller capacity (15 vehicles overnight versus 50 vehicles overnight) than was originally planned. This characteristic is transferable as there will be costs associated with establishing and running of such scheme. It may worth for cities which plan such scheme seeking funding similar to SMILE project.
	Revenues	High	1	The revenues come from the sale of gas. This characteristic is transferable as there will be income available from the sale of biogas.
Stakeholders' Involvement				
	EON Gas Regional public transport company Local dairy company Companies and owners of gas fuel vehicles in Malmo City of Malmo as a project facilitator and also as the producer and commercial provider of the raw biogas	High	0	EON Gas is a private company which has a leading role of project management. Regional public transport company as a transport operator offers strong support to the measure Local dairy company has a strong support for the measure. City of Malmo is a project facilitator and also the producer and commercial provider of the raw biogas. Transferability can be achieved where there is a coordinated approach to providing such services and where companies exists which are willing and able to provide necessary services required for successful operation of such schemes.

Components relevant to transferability of measure 5.2	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Technical Requirements				
	Upgrade biogas to natural gas	High	0	Ability to upgrade biogas to natural gas quality for usage in clean vehicles and to use the existing natural gas grid to carry upgraded biogas to fuelling stations. Transferability exists where cities which plan such schemes have the same technology.
Awareness and Communications				
	Awareness and acceptance	High	0	The awareness of the measure on the part of the general public in and around Malmö has been indirectly measured during April and May of 2008 as part of the General Public Survey undertaken as part of the evaluation. Approximately 3.1% of the general public associated Eon with biogas. The level of awareness found can be seen as a level that could be expected given the relatively small general awareness about gas in Sweden. Transferability exists where well planned marketing and consultation exercises can raise the level of awareness amongst population. Media can also act as powerful marketing tool by advertising availability of alternative fuels and their environmental and health benefits to attract people's attention and increase awareness.
Wider Issues				
	Culture / lifestyle / environmental benefits	Low	0	This measure has led to the reduction of 430 920 kg CO2 being emitted by vehicles in Malmö and the surrounding areas. Potential for transferability exists where awareness of environmental issues is present and people have the opportunity to make choices as to what vehicles to use for work or privately. Also, using biogas and natural gas to conventional fuel can be seen as a good thing or a trendy thing to attract more users.

Costs, Revenues and Cost Effectiveness

As explained in the measure template, the measure has consisted of implementing three separate facilities in different locations and with different functions. Costs are presented separately for each of the three facilities.

At Ystad a vehicle gas fuelling facility was established in a location remote from Malmo and the gas was transported by tanker to the site.

All Costs in National Currency					
Measure Duration:		18 years			
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	0	0	0	0	0
Year 2	0	0	0	0	0
Year 3	4,421,000	540,000	600,000	-4,361,000	-4,361,000
Year 4	0	1,450,000	1,500,000	50,000	-4,311,000
Year 5	0	2,170,000	2,300,000	130,000	-4,181,000
Year 6	0	2,890,000	3,100,000	210,000	-3,971,000
Year 7	0	3,700,000	4,000,000	300,000	-3,671,000
Year 8	0	3,700,000	4,000,000	300,000	-3,371,000
Year 9	0	3,700,000	4,000,000	300,000	-3,071,000
Year 10	0	3,700,000	4,000,000	300,000	-2,771,000
Year 11	0	3,700,000	4,000,000	300,000	-2,471,000
Year 12	0	4,600,000	5,000,000	400,000	-2,071,000
Year 13	0	6,100,000	5,000,000	-1,100,000	-3,171,000
Year 14	0	5,500,000	6,000,000	500,000	-2,671,000
Year 15	0	5,500,000	6,000,000	500,000	-2,171,000
Year 16	0	6,400,000	7,000,000	600,000	-1,571,000
Year 17	0	6,400,000	7,000,000	600,000	-971,000
Year 18	0	7,300,000	8,000,000	700,000	-271,000
Year 19	0	7,300,000	8,000,000	700,000	429,000
Year 20	0	7,300,000	8,000,000	700,000	1,129,000
Total	4421000	81950000	87500000	1,129,000	
NPV	3987489	51797024	55218713	-565800	
Average net present annual cost				-31433	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	395760	7336025	7832851	101066
NPV	356953	4636782	4943085	-50649
Average net present annual cost				-2814

A slow filling facility located in an area favourable for companies that operate heavy goods vehicles was set up late in the duration of the project.

All Costs in National Currency					
Measure Duration:	17 years				
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	0	0	0	0	0
Year 2	0	0	0	0	0
Year 3	0	0	0	0	0
Year 4	3,298,000	135,000	100,000	-3,333,000	-3,333,000
Year 5	0	2,460,000	3,000,000	540,000	-2,793,000
Year 6	0	4,060,000	5,000,000	940,000	-1,853,000
Year 7	0	4,060,000	5,000,000	940,000	-913,000
Year 8	0	4,060,000	5,000,000	940,000	27,000
Year 9	0	4,060,000	5,000,000	940,000	967,000
Year 10	0	4,060,000	5,000,000	940,000	1,907,000
Year 11	0	4,060,000	5,000,000	940,000	2,847,000
Year 12	0	4,060,000	5,000,000	940,000	3,787,000
Year 13	0	4,060,000	5,000,000	940,000	4,727,000
Year 14	0	5,560,000	5,000,000	-560,000	4,167,000
Year 15	0	4,060,000	5,000,000	940,000	5,107,000
Year 16	0	4,060,000	5,000,000	940,000	6,047,000
Year 17	0	4,060,000	5,000,000	940,000	6,987,000
Year 18	0	4,060,000	5,000,000	940,000	7,927,000
Year 19	0	4,060,000	5,000,000	940,000	8,867,000
Year 20	0	4,060,000	5,000,000	940,000	9,807,000
Total	3298000	64995000	78100000	9,807,000	
NPV	2874016	42486816	51099818	5738986	
Average net present annual cost				337587	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	295231	5818242	6991379	877906
NPV	257277	3803348	4574369	513744
Average net present annual cost				30220

A biogas upgrade facility which allowed injection of fuel onto the gas grid was developed the Sjölunda sewage water treatment plant.

All Costs in National Currency					
Measure Duration: 19 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	0	0	0	0	0
Year 2	300,000	0	0	-300,000	-300,000
Year 3	4,400,000	0	0	-4,400,000	-4,700,000
Year 4	14,100,000	5,850,000	7,200,000	-12,750,000	-17,450,000
Year 5	0	8,600,000	10,400,000	1,800,000	-15,650,000
Year 6	0	9,510,000	11,520,000	2,010,000	-13,640,000
Year 7	0	10,420,000	12,640,000	2,220,000	-11,420,000
Year 8	0	11,330,000	13,760,000	2,430,000	-8,990,000
Year 9	0	13,290,000	14,880,000	1,590,000	-7,400,000
Year 10	0	13,150,000	16,000,000	2,850,000	-4,550,000
Year 11	0	13,150,000	16,000,000	2,850,000	-1,700,000
Year 12	0	13,150,000	16,000,000	2,850,000	1,150,000
Year 13	0	13,150,000	16,000,000	2,850,000	4,000,000
Year 14	0	14,200,000	16,000,000	1,800,000	5,800,000
Year 15	0	13,150,000	16,000,000	2,850,000	8,650,000
Year 16	0	13,150,000	16,000,000	2,850,000	11,500,000
Year 17	0	13,150,000	16,000,000	2,850,000	14,350,000
Year 18	0	13,150,000	16,000,000	2,850,000	17,200,000
Year 19	0	14,200,000	16,000,000	1,800,000	19,000,000
Year 20	0	13,150,000	16,000,000	2,850,000	21,850,000
Total	18800000	205750000	246400000	21,850,000	
NPV	16535937	134667601	161380247	10176709	
Average net present annual cost				535616	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	1682944	18418391	22057310	1955975
NPV	1480269	12055215	14446486	911002
Average net present annual cost				47947

The cost profiles for the facilities vary due to the different nature of the delivery of the fuel and the market in each location. The cost effectiveness of each facility is determined separately and then a combined value is calculated for the measure as a whole.

These facilities have involved a significant up-front investment which requires a long period of operation for the cost to be recovered. Within the project period it is estimated that the introduction of these facilities, which were still operating well below capacity at the end of SMILE contributed a saving of 430.9 tonnes of CO_2 in 2008, from the sale of 8.4 GWh of biogas, to the value of 8.8 million SEK.

The cost templates indicate the value of gas expected to be sold from each plant over the 20 year period 2005-2024, as follows:

Facility	**Value of gas sold**	**Estimated total CO_2 reduction**
Ystad	87.5 m SEK	4285 tonnes
Depa	78.1 m SEK	3824 tonnes
Sjölunda	246.4 m SEK	12065 tonnes

These figures are based on the same assumption that the biogas produced locally displaces natural gas as a vehicle fuel. The demand for natural gas as vehicle fuel in the Malmo area is already sufficient for this to be a realistic scenario, since if all the biogas in this future scenario were indeed distributed it would not meet current demand.

Based on these figures, over the 20 year period the cost effectiveness of each facility is as follows:

Ystad: 132 SEK or €11.8 per tonne CO_2

Depa: -1501 SEK or -€134.3 per tonne CO_2

Sjölunda: -843.5 SEK or -€75.5 per tonne CO_2

It is worth emphasising that the negative sign for the latter 2 options shows a long term cost reduction associated with the achievement of the CO_2 reductions.

Taking the project as a whole, the overall figure is -760.9 SEK or -€68 per tonne CO_2

3.1.3 Measure 5.3: Clean Heavy Vehicles with CO_2 Cooler

Skånemejerier is the primary dairy products supplier in Malmö and the rest of Skåne. Skånemejerier's environmental planning and policy includes the reduction of environmental impacts from the transport of milk from farms to the dairies and dairy products from dairies to stores. Reductions in the environmental impact of transport can be achieved primarily in the following ways: change to newer vehicles with better fuel efficiency, change to vehicles using a cleaner source of energy, train drivers in eco-driving, maintain and tune vehicles to keep emissions low and fuel efficiency high, and logistics i.e. change the driving routes to reduce the number of kilometres driven with the same amount of delivered merchandise. This measure, 5.3, concerns the introduction of newer heavy vehicles using natural gas, and preferably biogas, as the fuel source and the training of drivers in fuel efficient, environmentally-friendly driving skills and habits.

Key Results

Summary of key evaluation results:

- Eco-driving was successful but up until at least March 2007 was not considered by Skånemejerier as sufficiently important or profitable to continue with refresher or brush-up sessions and/or onboard supporting equipment that helps drivers keep track of their fuel consumption. This despite eco-driving being a very profitable and not capital-intensive activity. This means that the positive results from 2005 - a reduction in fuel use of about 13% - have been difficult to maintain over a 2-year period.

- Procurement of methane-powered heavy vehicles has made the following impact on the total level of emissions from Skånemejerier: For the entire fleet (60 vehicles covering 12960000 km in one year) a reduction of 436.8 tonnes of CO_2, 1.6 tonnes of NOx, 29 kg PM_{10}, equivalent to 13.3%, 11.4% and 13.8% respectively.
  - Use of these vehicles has contributed to the demand for biogas which supports measure 5.2.
  - For the 10 trucks involved in the SMILE measure the emission reductions have been 50% for CO_2 64% for NOx 76% for PM_{10} for the 216000 km covered in one year
- Continuation of these measures within Skånemejerier probably will depend on the development of the following:
  - a. the degree to which the management of Skånemejerier perceives profitability in these measures and the importance of these measures to reduce emissions and fuel consumption as part of Skånemejeriers environmental profiled
  - b. the degree to which increasing divergence between costs for diesel and cost for biogas continues
  - c. the possibility for the fall in price for methane powered vehicles of the kind that Skånemejerier has purchased and uses for deliveries in and around Malmö
  - d. the expansion of fuelling stations for fuel gas both in terms of greater density in the areas of Sweden where Skånemejerier has it's principle business as well as elsewhere in Sweden

Recommendations

- Recommendation 1 – Given that the marginal cost of training the drivers (30 000 SEK) is a very profitable activity compared to the reduced costs for fuel, it should receive more active support. Therefore, it is strongly recommended that heavy eco-driving is routinely followed up by:
  - Training all drivers, even those not driving primarily in Malmö
  - Refresher training so that the lessons learned are not forgotten over time
  - The installation of on-board equipment that passively monitors fuel consumption with monthly statements of fuel consumption as a form of feedback to the driver and/or more active monitoring where the vehicle "signals" to the driver that he/she is exceeding certain parameters.
  - Changes to management procedures to highlight the benefits and incentivise staff based on the fuel consumption savings made.
  - Skånemejerier makes a strategic decision with regard to eco-driving to ensure that a programme is in place for regularly-scheduled refresher training.
- Recommendation 2 – Public sector organisations to consider the level of emission requirement set as part of any low emission zone and the impact that it will have on vehicle operators so that the investment cost and resulting benefit are in balance with any public sector financial support that is available.
- Recommendation 3 – It appears to be in everybody's best interest that where investment in clean technology is effective that this fact is communicated in order to speed uptake. However, the exception to this is where private sector organisations perceive a competitive advantage that they can exploit. In such cases the public sector needs to actively promote the changes and wherever possible contractual arrangements should be used to ensure co-operation from private sector partners.
- Recommendation 4 – A degree of training will be required for those who need to be involved in the maintenance of the new vehicles due to differences in procedures for gas vehicles and the new cooler systems. Ideally this will involve a fail-safe form of agreement to ensure maintenance takes place to an agreed schedule.

Transferability

Transferability of this measure exists where there are companies willing and able to introduce heavy clean vehicles and where there is co-ordinated approach of many participating organisations to provide all necessary services required to successful implementation of similar projects.

Components relevant to transferability of measure 5.3	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Skånemejerier's environmental planning and policy	High	1	Skånemejerier's environmental planning and policy includes the reduction of environmental impacts from the transport of milk from farms to the dairies and dairy products from dairies to stores. Reductions in the environmental impact of transport can be achieved primarily in the following ways: change to newer vehicles with better fuel efficiency, change to vehicles using a cleaner source of energy, train drivers in eco-driving, maintain and tune vehicles to keep emissions low and fuel efficiency high, and logistics i.e. change the driving routes to reduce the number of kilometres driven with the same amount of delivered merchandise. Measures associated with environmental policies have potential for transferability provided organisations have recognised similar problems and would have developed similar policies (and strategies) to tackle environmental issues.
Services Offered				
	To replace 10 Malmö-based heavy diesel vehicles with heavy natural gas vehicles between 2005 and 2008.	High	0	Skånemejerier aims to replace 10 Malmö-based diesel distribution vehicles (Euroclass II) with gas vehicles between 2005 and 2008. The purpose of this activity is to achieve the lowest environmental impact possible, from the farm to the customer. Gas powered vehicles will be equipped with cooling systems with CO_2 as a coolant. There are many advantages, one of which is that the CO_2 system is quieter, it is only the fan that is audible. Transferability exists where there are companies willing and able to introduce vehicles using natural gas.
	To train 16 drivers in heavy vehicle eco-driving	High	0	In this measure at least 16 drivers are trained in eco-driving for heavy vehicles, with repetitive training each year in order to get the best result. This service is transferable where there is support for and availability of such programmes and where opportunities exist to learn and practice eco driving.
Target Population				
	Customers and	High	0	The measures apply to loading of perishable products and distribution to shops

Components relevant to transferability of measure 5.3	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
	consumers			and supermarkets. In this way, the main target group consists of customers and consumers. Potential for transferability exists where customers and consumers can benefit from similar measures introduced by the businesses they use.
	The residents of the City of Malmö	High	2	The residents of the City of Malmö will benefit from the reduction of the local environmental impacts, especially NOx-emissions and small particulate emissions. Transferability exists as there are environmental benefits using natural gas vehicles to a wider population.
Geographical Area Covered				
	Fosie Industrial Zone of the City of Malmö	High	1	The area comprises loading and distribution from the dairy in the eastern outskirts, the Fosie Industrial Zone, of the City of Malmö. This characteristic is transferable to any organisation willing to introduce clean vehicles in a similar context and where there are available resources.
Finances				
	Operating costs	High	2	Operating cost is the cost of using the new vehicles. There is also a cost of education and training the drivers in eco driving which the measure template does not mention. This characteristic is transferable as there will be costs associated with establishing and running of such scheme. It may worth for cities which plan such scheme seeking funding similar to SMILE project. Regarding the training, this characteristic is transferable where resources are available as there will be costs associated with establishing and running of similar programmes. Also, willingness of business to participate is an important aspect of the success of such programmes.
	Revenues	High	2	Operating revenue comes from reductions in operating costs for fuel as there is reduction of fuel cost for vehicles.

Components relevant to transferability of measure 5.3	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				This characteristic is transferable as there are reduced fuel costs for clean heavy vehicles.
Stakeholders' Involvement				
	Skånemejerier – private dairy / distribution company Eon The public authorities Skånemejerier's lorry drivers Driver training organisations Vehicle manufacturers	High	0	Skånemejerier – private dairy / distribution company who own and operate the new clean vehicles and employ the drivers who have been trained. Eon is a key actor for Skånemejerier to achieve 100% biogas fuelling of its vehicles because they produce and supply the biogas. The public authorities who have been involved in specifying the environmental zone of the City of Malmo are indirectly involved because they have played a part in driving Skånemejerier towards specifying a particular level of environmental standard for the new vehicles purchased. Skånemejerier's lorry drivers are a key stakeholder in ensuring that the lessons learned are put into practice over a long period of time (ideally to be backed up by refresher training) because it is the drivers themselves who need to implement what they learn when they are driving in real world situations. Driver training organisations which need to exist in order to provide training. Vehicle manufacturers who need to be able to offer vehicles to whatever standard is specified by the purchaser / those who set the standards for a city environmental zone. Transferability can be achieved where there is a coordinated approach to providing similar services and where companies exists which are willing and able to provide necessary services required for successful operation of such schemes. Transferability requires a group effort.
Awareness and Communications				
	Awareness and acceptance	High	0	About 4-6% of the public are either aware of Skånemejerier's activities in SMILE or associate Skånemejerier with the use of biogas, eco-driving, and an increasing number of environmental vehicles. These figures suggest that the level of

Components relevant to transferability of measure 5.3	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				awareness is low on the part of the public, perhaps because of the absence of marketing by Skånemejerier. Starting during 2008 but increasing during the year, Skånemejerier has embarked on promoting its environmental credentials with the general public. Transferability exists where well planned marketing and consultation exercises can raise the level of awareness amongst population. Transferability exists where participants of similar training programmes recognise the importance and benefits of eco driving and are willing to apply eco driving techniques and promote the concept to their colleagues.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 9 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	205,296	2,133,763	130,000	-2,209,059	-2,209,059
Year 2	83,067	3,332,124	150,000	-3,265,191	-5,474,250
Year 3	497,689	1,984,795	510,000	-1,972,484	-7,446,734
Year 4	69,750	3,185,250	550,000	-2,705,000	-10,151,734
Year 5	0	0	560,000	560,000	-9,591,734
Year 6	0	0	560,000	560,000	-9,031,734
Year 7	0	0	560,000	560,000	-8,471,734
Year 8	0	0	560,000	560,000	-7,911,734
Year 9	0	0	160,000	160,000	-7,751,734
Total	855802	10635932	3740000	-7,751,734	
NPV	785568	9738113	3114802	-7408878	
Average net present annual cost				-823209	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	76610	952111	334798	-693922
NPV	70323	871739	278832	-663230
Average net present annual cost				-73692

The cost table above relates primarily to the investment in the 10 natural gas vehicles that have then been purchased using co-funding through SMILE and operated on ‘vehicles gas’ (50% biomethane – 50% natural gas) that is available in Malmo.

The CO_2 reduction as a result of the investment in 10 vehicles with SMILE co-financing has been 273 tonnes per year. Taking this saving over the operational life of the vehicles and using the annualised costs shown in the table above, this gives a cost effectiveness value of -3015.4 SEK/tonne or -€270/tonne. As for measure 5.2, the minus sign indicates a long term cost reduction (due to the lower price of the vehicle gas) associated with the achievement of the CO_2 reductions.

Corresponding figures for other pollutants included in the evaluation are:

NOx -646.9 SEK/kg or -€57.9/kg

PM10 -35584 SEK/kg or -€3185/kg

3.1.4 Measure 5.8: Environmentally Adopted Cars

The University Hospital, Malmö General Hospital (UMAS) is one of the hospitals owned and operated by the regional health authority which is part of the regional authority called Region Skåne.

The long-term goal of this measure is that all hospital vehicles in Region Skåne will be clean vehicles. As a first step in this direction the plan within SMILE was to replace 30 hospital cars by the end of 2008 so that at least 50% of the UMAS vehicles would be clean vehicles by the end of SMILE.

Key Results

Summary of key evaluation results:

- Despite the reorganisation, this measure succeeded largely in obtaining and using clean vehicles to the extent included in the objectives during each year.
- Key result – While the percentage of vehicles that were clean that was obtained each year exceeded the targets in objectives 1-3, the rate of retirement of existing vehicles was less than half the rate that was assumed in the original planning for the measure. This means that it was not possible to reach a total of 50% clean vehicles in the entire fleet by the end of SMILE.
- Key result – 20% reduction in CO_2 emissions from the UMAS fleet as a result of vehicle purchasing decisions.
- Key result – 12.8% reduction in NOx emissions from the UMAS fleet as a result of vehicle purchasing decisions.
- Key result – 2.5% reduction in PM_{10} emissions from the UMAS fleet as a result of vehicle purchasing decisions.
- Key result – This measure has largely led to the adoption of bi-fuel E85/petrol vehicles (running largely but not exclusively on ethanol) and a very low level of adoption of other types of vehicles, specifically gas vehicles.

Recommendations

- Recommendation 1 – For an outsider looking into this measure it is clear that there needs to be a clearer delegation of authority which leads to the better fulfilment of the transportation and environmental goals established by Region Skåne.
- Recommendation 2 – to increase awareness and acceptance amongst the inhabitants of Malmo procurement of clean vehicles with emphasis on gas vehicles, particularly using biogas as developed in other SMILE measures, could be supplemented by marketing campaigns and activities to promote clean vehicles and their benefits.
- Recommendation 3 – relatively high level of procurement which has occurred could be used to market this measure to other governmental and private organisations.
- Recommendation 4 – it is worth establishing the reasons amongst senior UMAS staff for a relatively low percentage of procured gas vehicles as it was hoped that the shift in acceptance would be directed more towards gas vehicles for this measure.

Transferability

This measure has potential for transferability where organisations have resources and ability to introduce clean vehicles for use for their employees. Promotion of environmental benefits can help raise awareness of such schemes amongst the organisations, authorities, employees and general public.

Components relevant to transferability of measure 5.8	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Services Offered				
	Procurement or leasing of clean vehicles for UMAS, University Hospital, Malmo General Hospital	High	0	The aim is that by the end of SMILE 50% or more of all vehicles leased and operated by UMAS for use by the hospital staff or for the UMAS transport department will be clean vehicles. This characteristic doesn't necessarily classify as service but it is the main objective of the measure. Transferability exists where organisations plan to adopt similar measures to reduce emissions and have resources to do so. It may also be worth exploring opportunities for funding arrangements similar to CIVITAS project.
Target Population				
	Employees at UMAS	High	0	Clean vehicles are to be used on a daily basis by employees of UMAS. Transferability potential exists where there is willingness amongst organisations to introduce such activities and encourage their employees to use clean vehicles and where employees themselves recognise the benefits of using clean vehicles in their everyday duties.
Geographical Area Covered				
	UMAS, the city of Malmo and region Skåne	High	1	All hospitals in Skåne are part of the regional health authority. When the term Region Skåne is used it refers to all of the regional authority and not just UMAS. The long-term goal of this measure is that all hospital vehicles in Region Skåne will be clean vehicles. As a first step in this direction was to start replacing UMAS cars so that at least 50% of the UMAS vehicles would be clean vehicles by the end of SMILE. This characteristic is transferable to any city and organisation able and willing to promote the usage of clean vehicles and where there are resources available to introduce such measures.
Finances				
	Costs	High	2	According to the measure database there are operational costs associated with personnel, travel and subsistence, subcontracting, consumables, OH and

Components relevant to transferability of measure 5.8	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				investment costs of durable equipment. There are also the costs of procurement and leasing of clean vehicles and their maintenance. This characteristic is transferable where there are resources available as there will be costs associated with introduction of such measures. It may worth for cities which plan such scheme seeking funding similar to SMILE project.
Stakeholders' Involvement				
	Local transportation department Car drivers Car sharing users Employees at workplace General public Manufacturers of clean vehicles for use for UMAS Suppliers of clean vehicles for use for UMAS	High	0	A number of stakeholders are affected by this measure. Transferability can be achieved where there are authorities and organisations which are able and willing to introduce such measure and where the target groups of users are willing to use clean vehicles at work and privately.

Components relevant to transferability of measure 5.8	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Legal or contractual Requirements				
	Contracts	High	1	Contracts would have been set up between regional health authority and suppliers for procurement services. Transferability exists where such contractual arrangements need to be in place for successful running of the project.
Technical Requirements				
	Clean vehicles	High	0	This measure involves procurement and leasing of all new vehicles to be clean vehicles for usage by UMAS employees. Transferability has potential where suppliers of clean vehicles exist and where organisations are willing and able to introduce such measures.
Awareness and Communications				
	Awareness and acceptance	High	0	Awareness of the potential for using clean vehicles was not particularly high on the part of senior UMAS staff prior to the start of SMILE. Following the start of the measure awareness rose and the majority of decision-makers seem to accept that new vehicles should be clean cars. There is however a tendency to select bifuel petrol/E85 vehicles. Only 8% of all vehicles obtained during the measure were petrol/gas bifuel vehicles which is a smaller percentage than the 16% of the vehicles which were non-clean cars. The original goals were that about half of the vehicles procured should be gas vehicles. This may show a shift in acceptance towards cleaner cars but not as much in the direction of gas vehicles as had been hoped for on the part of the measure. It is worth establishing the reasons amongst senior UMAS staff for a relatively low percentage of procured gas vehicles as it was hoped that the shift in acceptance would be directed more towards gas vehicles for this measure. This is something which can be considered when assessing transferability potential.

Components relevant to transferability of measure 5.8	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Wider Issues				
	Wider application of the measure	Medium	0	High level of procurement which has occurred could be used to promote this measure to other governmental and private organisations. This needs to be complemented by a good marketing approach to ensure raising awareness and acceptance amongst wider population and promotion of the usage of clean vehicles and all its associated benefits. Transferability exists where authorities and businesses have resources to introduce and implement such measures and recognise their wider benefits.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 3 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	41,000	19,100	0	-60,100	-60,100
Year 2	0	10,500	0	-10,500	-70,600
Year 3	18,6000	11,000	0	-29,600	-100,200
Total	59,600	40600	0	-100,200	
NPV	56,390	38177	0	-94,567	
Average net present annual cost				-31,522	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	5335	3634	0	-8970
NPV	5048	3418	0	-8465
Average net present annual cost				-2822

The above costs are based on the additional costs of leasing 'clean' cars as part of this measure as compared with their conventional counterparts. The vehicle replacement cycle at UMAS is supposedly 3 years. Although in practice it was found to be longer, 3 years has been used as the duration of the measure in terms of annualising the total investment cost and also the period over which the emissions benefits have been calculated.

CO_2: the reduction over 3 years is 344 tonnes leading to cost effectiveness values of 274.9 SEK / tonne CO_2 or €24.6/tonne CO_2.

NOx: the reduction over 3 years is 63.3 kg leading to cost effectiveness values of 1494 SEK / kg or €133.7/kg.

PM10: the reduction over 3 years is 0.9 kg leading to cost effectiveness values of 105074 SEK / kg or €9406/kg.

3.1.5 Measure 6.1: Extended Environmental Zone for Heavy Vehicle and Enforcement

Measure 6.1 includes changes in the geographical extent of the existing environmental zone for heavy vehicles in Malmö, the educational efforts to inform relevant actors in the freight sector about the changes including the extent of and regulations concerning the zone, and changes in the enforcement methodology and organization.

Key Results

Summary of key evaluation results:

- Among large freight companies based in an around Malmö, about 30% of all new vehicles acquired during SMILE were the direct result of the zone. 70% of the new vehicles would have been acquired otherwise, either because of a natural rate of retirement or because of the favourable economic conditions up until approximately half-way through 2008. Lorry owners and operators have clearly accelerated their retirement of vehicles since the compliance rate increased by approximately 5%. The pattern of new vehicle registration also clearly demonstrates a change caused by 6.1
- Emissions of NOx and PM_{10} fell because of 6.1. For NOx the reduction is on the order of 10 tonnes per year (6%) and for PM_{10} this is estimated to be 370 kg per year (10%). However, because of a general increase in traffic volumes in and around Malmö, the impacts of these reduced emissions cannot be found in the ambient air quality and the levels of NOx and PM_{10} measured in the air quality measurement stations run by the City of Malmö.
- Impacts beyond the zones. Since compliance levels outside the old zone in 2005 and outside the new zone in 2007 are just a little lower than within the then existing zone, it is clear that areas of Malmö outside the zone enjoy benefits from the zone. It was not part of the original evaluation methodology to gauge these impacts and therefore any discussions about this include uncertainty but it would appear that a significant part of Malmö outside the zone has a majority of the traffic volume in compliance with the zone regulations.

Recommendations

- Recommendation 1 – Enforcement and information. Regular enforcement of the zone has not yet occurred. The City of Malmö, as opposed to for example Göteborg, does not want to put up signs that show where the zone starts. This may send a signal to drivers that, together with the very irregular enforcement to date, it is "OK" to nip into and out of the zone with lorries that do not comply with zone regulations. In the long term this will probably lead to reduced compliance and increasing irritation on the part of lorry drivers and owners that have hitherto complied with the zone regulations. The city has to develop a strategy where enforcement and information provisions, perhaps in conjunction with the police and even involving visits to offender institutions, are linked and mutually reinforcing. Possible inspiration from successful approaches, campaigns, activities in SMILE 11.1 can be considered when the strategy is under development. While previously information to non-Swedish drivers and freight firms has been addressed (information materials in German and English), this should be extended to additional languages (Polish ? French ?). Furthermore, perceived zone legitimacy on the part of Swedish actors will be enhanced if real, practical enforcement of zone regulations is extended to foreign based lorries and their drivers. It is of great importance, in this context, that information about this enforcement be communicated to relevant local actors since it is unlikely that local freight firms and their drivers will perceive that a police stop of a foreign registered lorry was because of enforcement of the environmental zone. Why is this important? The reason is that Swedish drivers and the companies that they drive for are part of an informal network and share a common working language. When police enforce zone regulations and Swedish drivers are affected, news about this would travel in the informal network among Swedish drivers and companies. Enforcement where foreign drivers' experiences are involved would not tend to become known among Swedish drivers because of being parts of different informal networks. Preventative effects arising from enforcement news in an informal network might lead to greater compliance levels among domestic drivers. However, without tangible evidence and knowledge of enforcement among foreign drivers the rumour among Swedish drivers that foreign drivers are exempt from the zone regulations will continue, despite information pamphlets sent to domestic firms.

- Recommendation 2 – Up-scaling: Once the interlinked enforcement and information strategy is decided, approved and funded as a regular feature in Malmö, attention should be placed on up-scaling. The combination of up-scaling options listed under C4 may be consulted. To ensure that enforcement and information activities can also be up-scaled to the new level will require consideration of the realization of recommendation 1 in light of the probably changes resulting from up-scaling in recommendation 2.
- Recommendation 3 – Collaboration outside Malmö: The Department and other relevant actors in the city administration as well as others, should consider which other municipalities near Malmö and located at strategic locations within the rest of Sweden and in neighbouring countries should be invited to Malmö to hold a conference about environmental zones. The goal is to spread information and interest about the zone methodology, intended results etc so that the likelihood of other cities or towns adopting similar zones would increase. With greater and greater numbers of similar zones in cities where lorries -- that travel close to Malmö or have errands in the Malmö zone – are based, this will lead to increased compliance in Malmö in the short-term. In the long-term a network of “zone cities” may result which would be beneficial locally as well as establishing a regional or perhaps even EU-wide best practice which would make it easier for international freight operators to comply with uniform regulations and practice throughout a larger area.
- Recommendation 4 - Evaluation matters: In preparation for possible future changes in the zone in Malmö, it would be very advantageous if the Department of Streets and Parks, either themselves or in conjunction with others, conduct regular monitoring of traffic flows of the type conducted each October as part of SMILE. In this way it would be possible for the Department to follow flows, compliance issues, and estimate changes in emissions in the existing zone, areas outside the zone but in Malmö where a future zone might be expanded to but even in areas on the outskirts of Malmö and in surrounding municipalities. This information would prove vital for the planning of changes in the zone, the establishment of a baseline, and the ability to find and evaluate changes in flows and emissions stemming from future changes in the zone. It is the technical evaluator’s understanding that the Department has take a first step in this regard by planning to repeat the October study during October 2008. Furthermore: while not part of SMILE per se because of deadlines in the process of the technical evaluation, it would be advantageous if the Department of Streets and Parks, either themselves or in conjunction with others, conduct a study about driver/owner awareness and acceptance issues. This study would be a follow-up of the study conducted by mail and telephone during 2005. The delivery mechanism should be by sending an initial mailing by post with maps and similar materials and warning the recipient that a telephone interview would take place during the coming days. In this way the interview could include references to the printed material that would otherwise be difficult to manage during a regular telephone interview. The goal should be to have 200 complete responses to make the result comparable with the 2005 study.
- Recommendation 5 – Establishment of an environmental zone for light vehicles: Cars and similar light vehicles make up the majority of traffic volume in Malmö. The city might consider an environmental zone for cars corresponding to the geographical coverage of the old zone for heavy vehicles which could later expand to the same geographical coverage as the new environmental zone for heavy vehicles.
- Recommendation 6 – Regulation: To ensure better zone enforcement it is recommended to introduce and implement stricter regulations for heavy vehicles. These can be achieved by

discussion with ministry of industry and EU and communication with other involved municipalities and concerned state departments.

- Recommendation 7 – Information campaigns: It is worth considering information campaign promoting larger environmental zone and informing the public and companies about stricter regulations for heavy vehicles to achieve better compliance and environmental benefits.

Transferability

This measure has potential for transferability as similar schemes already exist in Europe. It is important to get a buy in from relevant stakeholders and offer all necessary advance information to the affected lorry operators to make measures like this a success and to achieve their full environmental benefits.

Components relevant to transferability of measure 6.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Services Offered				
	To reduce emissions from heavy vehicles in central Malmö	High	0	This measure includes changes in the geographical extent of the existing environmental zone for heavy vehicles in Malmö, the educational efforts to inform relevant actors in the freight sector about the changes including the extent of and regulations concerning the zone, and changes in the enforcement methodology and organization. This service is transferable as a concept to cities which have similar plans for improving air quality resulting from heavy traffic. Extending and introducing clean zones can be achieved using objectives relevant to particular requirements of clean zones in the cities.
Target Population				
	Inhabitants of Malmö	High	1	In the long run this measure will hopefully have positive affect on the inhabitants of Malmö by reduced emissions. About 200 000 people live and 75 000 are working inside the new clean zone. Reduced emissions resulting from introduction of clean heavy vehicle zones have benefits on the environment and people living and working inside and nearby these areas.
Geographical Area Covered				
	UMAS, the city of Malmö and region Skåne	High	1	The new clean zone is 7x8 km, located in central Malmö. This characteristic is transferable to any city willing to introduce clean environmental zones in a similar context and where there are resources available to introduce such service.
Finances				
	Costs	High	2	Operating costs are the costs personnel, consumables and subcontracting. This characteristic is transferable as there will be costs associated with establishing and running of such scheme but they may be city specific. It may be worth for cities which plan such scheme seeking funding similar to SMILE project.

Components relevant to transferability of measure 6.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
	Revenues	High	2	There are no revenues for this measure, however there are environmental benefits associated with reduced emissions.
Stakeholders' Involvement				
	City of Malmö Streets and parks department Municipalities in Sweden – Göteborg, Stockholm, Lund Firms in and around Malmö National level political organisations	High	0	City of Malmö Streets and parks department has a leading role in the project Municipalities in Sweden – Göteborg, Stockholm, Lund, participated in discussions with ministries and authorities concerning the changes in the provisions of the "Swedish Road Traffic Ordinance". Firms in and around Malmö – Some freight companies participated in discussions with the Department of Streets and Parks about the new zone. These were either informal and one-on-one or in a more formal setting with several representatives participating at a time. National level political organisations – police, government ministries at the national level. It is important for schemes like this to have a support from a wide range of stakeholders to ensure their implementation and enforcement. A coordinated approach of various interested organisations and politicians is required to ensure the success of the project.
Legal or contractual Requirements				
	Contracts	High	0	This measure tried to influence and change Swedish laws concerning environmental zones to permit others than the police to enforce compliance and was unsuccessful. Malmo city was unable to realise the extension of the right to enforce the zone themselves by using the powers of municipal authority. Countries have different laws concerning enforcement of compliance of such schemes and as long as the compliance is legally enforced by an authority with relevant powers the projects like this can be successful achieving the environmental benefits.

Components relevant to transferability of measure 6.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Awareness and Communications				
	Awareness and acceptance	High	0	Awareness was measured for general public and lorry owners and operators. Malmo has had an environmental zone since 2002 which has not generated a lot of awareness with general public. However, it appears that many respondents feel that the zone is needed but at the same time it is thought that they do not know what a zone is or know too little about it. Coordinated marketing approach and campaigns can raise people's awareness and promote the environmental benefits of such projects. The information about awareness and acceptance of lorry owners is available only from prior the establishment of a new zone. Awareness and acceptance tends to be greater in larger organisations which probably reflects their ownership of vehicles which comply with the environmental zone requirements. It is important that the lorry owners and companies are aware of such schemes to be able to comply with their enforcement. Smaller companies might find it harder to retire diesel vehicles in favour of a clean fleet as this represents extra costs. Information about clean zones need to be communicated as far in advance as possible so that all companies regardless of their business profile and size can take the appropriate measure to comply with zone enforcement and requirements.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 4 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	0	202,287	0	-202,287	-202,287
Year 2	0	296,840	0	-296,840	-499,127
Year 3	0	160,693	0	-160,693	-659,820
Year 4	0	50,000	0	-50,000	-709,820
Total	0	709820.26	0	-709,820	
NPV	0	661058	0	-661058	
Average net present annual cost				-165264	

Adjusted to Euros, allowing for purchasing parity conversions					
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	
Total	0	63542	0	-63542	
NPV	0	59177	0	-59177	
Average net present annual cost				-14794	

The above costs are based on a four year project life, which is a rather pessimistic premise, since once in place the environmental zone should be able to exist with lower running costs until emission reduction technologies are longer able to deliver improvements.

CO_2: the reduction per annum is 97 tonnes leading to cost effectiveness values of 1704 SEK / tonne CO_2 or €152.5/tonne CO_2.

NOx: the reduction per annum is 33 tonnes leading to cost effectiveness values of 5.0 SEK / kg or €0.45/kg.

PM10: the reduction per annum is 1.2 tonnes leading to cost effectiveness values of 137.7 SEK / kg or €12.3/kg.

3.1.6 Measure 7.1: Marketing of Clean Vehicles by Subsidised Parking

The overall goal of this measure is to contribute to a change in the public's acceptance and perception of clean vehicles and that clean cars might be a possibility worth considering the next time a member of the public is looking to buy a car.

The method chosen to try to achieve this was a subsidised parking scheme for clean cars in the city of Malmö. Through this scheme owners of clean vehicles can apply for permission to park their cars at a reduced cost. This applies for vehicles not older than three years that comply with the clean vehicle definition of Malmö (i.e. gas, ethanol, hybrid or pure electric). The permission lasts and costs a fee of

300 SEK. In return the first hour parked in parking spaces administrated by the city of Malmö is free of charge. The following time is charged at normal rate. The subsidized parking does not yet apply in private parking spaces.

Key Results

Summary of key evaluation results:

- The offer with free parking for an hour after paying 300 SEK for a permit is used by quite a lot of the owners of a clean car. Based on the results of an on-street public survey, 5.5% of the respondents were using it seven month after the implementation (1031 permits issued) and that is a high proportion considering that (based on results of the same survey) 7.4% of the fleet in Malmö is clean. However, this does not differentiate between newly purchased and older clean cars and the motivation for the purchase.
- The offer itself is probably working as a bonus for those who have already decided to buy a clean car anyway. The offer itself has, according to several studies, very little impact on the decision.
- The most important thing when you buy a new car is safety and price. To save the environment is important, but not as important as those factors. The reason why the portion of clean cars among new cars is rising is probably a mix of environmental and economic consideration. The 10,000SEK bonus if you buy a clean car is one example, and the high petrol prices compared to prices for alternative fuels is another example of stronger economic driving forces behind the decision to buy a clean car. The offer with free parking for an hour is an example of a small economic bonus.
- An exact calculation of the emissions benefits of the measure has not been possible because of the difficulty in attributing a certain impact on purchase decisions. However, an estimation has been made that suggests the impacts to be approximately:
  - CO_2 190 828 kg, max
  - NOx 151kg, max
  - PM_{10} 10.3 kg, max

Recommendations

- Recommendation 1 – Conduct a full prior research study into the likely influence of parking charges at city council car parks on purchase decisions and compare with other options (e.g. differential residential parking charges, reduced tolls, preferential access to certain areas of the city etc). Relate to the wider influencing factors on vehicle purchase. Also consider and adapt to changes in circumstances at the national level, such as the national purchase subsidy that was implemented in this case.
- Recommendation 2 – Use the prior research study to set realistic and quantified objectives and conduct ongoing or interim monitoring rather than after an extended period.
- Recommendation 3 – Develop a strong relationship with vehicle manufacturers and their local agents (car dealerships) and develop a clear marketing strategy to promote the measure.

Transferability

This measure has potential for transferability where authorities have the resources and political support to introduce free parking. Such measures can stimulate the ownership and usage of clean vehicles and promote wider environmental benefits.

Components relevant to transferability of measure 7.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Strategies and Policies				
	New policy instrument	High	1	This measure brings new regional policy instrument, a combined set of activities for subsidized parking, information to car salesmen and car companies, procurement of clean vehicles and information to companies and organisations which is rare on this large scale. These are activities rather than a policy itself, which are designed to help meet environmental objectives and contribute to an increase in public perception and acceptance of clean vehicles. Measures associated with environmental policies have potential for transferability provided the city authorities and organisations have similar objectives and would have developed similar policies (and strategies) to tackle environmental issues.
Services Offered				
	Subsidised parking for clean vehicles in the city of Malmo	High	0	The subsidizing parking system was formally implemented in October 2007. It was possible for owners of clean vehicles to apply for the permission until the last of December 2008. After that the city of Malmö will decide weather or not to continue offering subsidized parking to owners of clean vehicles. Included in this measure is the development maintenance and operation of the web site www.miljofordon.se, which is a web site focusing on relevant issues within the field of clean vehicles and alternative fuels. The web site is the result of cooperation between the three largest municipalities in Sweden – in addition to Malmö, Gothenburg and Stockholm are also involved in the operation of the site. Transferability exists where the authorities have similar initiatives to promote clean vehicles, with political backing and new parking regulations.
Target Population				
	Public and companies in Malmö	High	0	The general idea is to make it more attractive to own and use a clean vehicle. The measure was expected to have significant effect, since car owners tend to overrate parking costs relative to the total cost of owning and using a car. There has also been a strong support form the general public. The parking direction will also

Components relevant to transferability of measure 7.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				apply to clean vehicles owned by inhabitants from other parts of Sweden. It also important to involve companies with extensive car fleets which are used for quick trips and require shorter parking. Transferability has potential where the support from the public exists, where the public has the opportunity to purchase and maintain clean vehicles and where the companies are willing to introduce clean vehicle fleets. Also it is worth establishing the main reasons for public support and willingness to purchase clean vehicles and how companies may benefit from similar projects.
Geographical Area Covered				
	Malmö city centre	High	1	The new parking regulation features the introduction of a no-pricing-direction for parking clean vehicles at streets, squares, parking houses and other public areas within the jurisdiction of the municipality of Malmö. This characterises is transferable to any city willing to adopt car parking in a similar context and where there are resources available and political support to introduce such service.
Finances				
	Operating Costs	High	2	Operating costs are the costs of marketing campaigns and running a website with clean vehicles information. Transferability exists as there are likely to be the costs associated with such projects, however the costs may be specific to how the authorities are planning to introduce and promote such projects.
Stakeholders' Involvement				
	Streets and Parks Department (Gatukontoret) Politicians	High	0	Streets and Parks Department (Gatukontoret) has leading role in developing and administrating the parking direction. Politicians needed to make the decision to set the level of incentive and then approve the scheme. General public participate through vehicle purchase and registration.

Components relevant to transferability of measure 7.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
	General public Local businesses Car dealerships Other major cities in Sweden			Local businesses participate through vehicle purchase and registration, and are actually a more common participant than the general public. Car dealerships who would be expected to use this measure as a way to publicise the benefits of clean vehicles to potential purchasers. Other major cities in Sweden who co-operated in developing common definitions and schemes. Transferability can be achieved where there is a coordinated approach to providing similar services, where there is political support and available resources, where the public is responsive to and supportive of similar activities and where companies exists which are willing and able to promote necessary activities required for successful operation of such schemes.
Organisational or institutional aspects				
	Procedure	Medium	0	This involved presenting the proposal to the politicians by adhering to normal procedures and formal proceedings with the aim of making the Municipal Council adopt the proposal. A concept like this is transferable where similar requirements and procedures exist for approval of such projects.
Awareness and Communications				
	Awareness and acceptance	High	0	According to the measure evaluation 97% of respondents have knowledge of clean vehicles and 39% knew about free parking for clean vehicles and 5.5% were using it. At the time of the survey, the offer of free parking was on the market for only 7 months which shows quite high levels of awareness and acceptance. According to the objectives the acceptance level should rise from 50% in favour before this measure to 90% in favour if the measure were still in place after four years as was originally planned. The acceptance level was a lot higher than 50% before the measure. In fact it was over 90% in favour of proposals to increase the percentage of clean cars in the Malmo region and 80% in favour of the City of

Components relevant to transferability of measure 7.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				Malmö offering free or subsidized parking for clean cars before the measure. Transferability can be successful where there is strong support form public and businesses. Also, appropriate survey process and evaluation methodology needs to be developed and used to determine the increase in levels of awareness and acceptance.
Wider Issues				
	Wider application of the measure	Low	0	Implementation of stronger support measures for clean vehicles at national level can outweigh the impact of the subsidised parking. This needs to be complemented by a good marketing approach to raise awareness and promote the usage of clean vehicles and all its associated benefits. Transferability exists where authorities and businesses have resources and willingness and political support to introduce and implement such measures and recognise their wider benefits.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 1.33333 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	75,000	175,000	240,000	-10,000	-10,000
Year 2	0	55,000	60,000	5,000	-5,000
Total	75000	230000	300000	-5,000	
NPV	72464	220425	287895	-4994	
Average net present annual cost				-3746	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	6714	20589	26855	-448
NPV	6487	19732	25772	-447
Average net present annual cost				-335

The above costs are based on a short project life, as at the time of the calculation the future of the measure was under review. Since then the measure has been confirmed as in existence for another 12 month period. By calculating the cost effectiveness on an annual basis this ongoing review will be reflected in the data.

CO_2: the reduction per annum is quoted as 190 tonnes maximum per year leading to cost effectiveness values of no better than 19.7 SEK / tonne CO_2 or €1.76/tonne CO_2.

NOx: the reduction per annum is 151 kg maximum leading to cost effectiveness values of no better than 24.8 SEK / kg or €2.2/kg.

PM10: the reduction per annum is 10.3 kg maximum leading to cost effectiveness values of no better than 363.7 SEK / kg or €32.5/kg.

3.1.7 Measure 8.1: Marketing of New Bus Route System

A new bus route system was implemented in Malmö on 12 June 2005. Measure 8.1, which involved the marketing and information activities connected to the start of the new bus route system, was one of a package of measures aimed at increasing awareness and use of buses within the city.

To this end a communication plan was prepared focusing on both internal and external communication. The internal communication was divided into two parts; one being the communication aimed at bus drivers and the other part being meeting with different interest organisations. External communication was mostly focusing towards the public – both regular commuters and other users.

An ambassador group was formed consisting of representatives from Skånetrafiken, municipality of Malmö and bus operators. The ambassador group was trained and then sent to different forums, events and meetings to address concerns and to inform about the changes in the bus routes.

Skånetrafiken chose three key phrases for the campaign and information materials:

- Greener, which implied that with more people on buses there would be fewer cars hence less pollution. (Furthermore, buses in Malmö run on methane which is a cleaner and greener fuel than diesel.)
- Easier, which meant that the new bus route system would be easier to remember with fewer, better organised bus lines.
- More often, which referred to the higher frequency of buses, during rush hour buses on the 8 main routes depart every 5-6 minutes

Key Results

Summary of key evaluation results:

- The marketing campaigns themselves had an impact on travel behaviour but since the main part of the marketing activities coincided with the actual change in travel opportunities, it is impossible to know the relative effects on number of passengers of the marketing versus the actual “physical” change of the bus route system.
- The objectives for the awareness and acceptance level of the bus route change among the frequent travellers were only partly met by the marketing activities in this measure. This should not be seen as an indication that the marketing and communications were not successful as the goals were ambitious.

Recommendations

- Recommendation 1 – marketing and information strategy can be further developed to form part of wider local and regional transport strategy and policy to encourage uptake of similar measures in other cities and towns
- Recommendation 2 – it might be worth repeating the after surveys with a bigger sample size to obtain a more representative and robust data to determine the success of this measure
- Recommendation 3 – it is worth building on this experience when considering similar projects to achieve a wider uptake of this measure
- Recommendation 4 – to gauge the success of a measure its objectives need to be tangible, achievable and measurable. It is recommended that the objectives are properly researched prior the start of the project to meet the project requirements and enable the evaluation process to correctly measure their achievements and overall success of the project, especially where there are many measures with similar objectives trying to achieve similar benefits
- Recommendation 5 – according to Fearnley, 2005, usually the effects of a major change in bus route system comes momentarily and then during two years after the change. It might have been worth repeating the surveys to establish the validity of this theory and with it the success of the measure
- Recommendation 6 – it is recommended to promote the new bus routes together with other modes of public transport at all interchanges to achieve modal shift and wider usage of public transport

Transferability

This measure has a potential for transferability as it is important for urban areas to achieve an increase in public transport usage. New bus route systems can attract more passengers provided marketing campaigns and promotional activities are designed to make information on the new bus route system and any changes from the old system easily available to and understandable by the travelling public. Providers of new bus systems also need to take into consideration accessibility issues and availability of information of other modes of public transport at all interchanges to achieve modal shift and wider usage of public transport.

Components relevant to transferability of measure 8.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Services Offered				
	Marketing and information activities	High	1	The goal of this measure is to market the new bus route system to increase the number of bus travels. Skånetrafiken changed the bus route system to 8 main lines and 6 support lines to be able to increase the amount of travellers. It should be easy to travel and the route system should be simple and easy for the travellers to use. To achieve an increase in bus patronage well planed and co-ordinated marketing campaigns and promotional activities need to be developed. For easy access to information it needs to be available on the buses, by the mail, at public meetings and via direct marketing.
Target Population				
	Habitants of Malmö as well as commuters from others cities in Skäne that commute to and from Malmö	High	1	The new bus routes will make the network simple to understand and reduce the amount of time that the travellers have to wait for the bus. The focus of this project is to inform the travellers by campaigns, signs, test-ticket etc. Marketing campaigns and promotional activities need to be designed to make information on the new bus route system and any changes from the old system easily available to and understandable by the travelling public. It is necessary to inform the citizens, travellers, companies and organisations to be able to get the attention of this new change.
Geographical Area Covered				
	City of Malmö	High	1	This measure applies mainly to people living and working in Malmö and also larger cities outside Malmö. The aim is to adapt the information so it focuses on different areas in the municipality. In this way it is easier to show the changes in each area and to identify the impact of each change. This characteristic is transferable to any city where public transport providers are willing to improve transport services in a similar context and where there are resources available to introduce such service and its associated marketing activities.

Components relevant to transferability of measure 8.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Finances				
	Operating Costs	High	2	Operating costs are the costs of marketing campaigns. This characteristic is transferable as there will be costs associated with promotional activities. It may be worth for cities which plan such scheme seeking funding similar to SMILE project.
	Revenues	High	2	Operating revenues include revenues from the increase in bus patronage and are dependent on the ticket cost structure. This characteristic is transferable as it is in operators' interest to achieve an increase in public transport patronage.
Stakeholders' Involvement				
	Skånetrafiken, regional transport authority Municipality of Malmö ID Kommunikation Regional public transport committee Public transport users in Malmo Veolia Transport and Arriva	High	0	Skånetrafiken, regional transport authority, is a measure leader, responsible for the traffic in the region of Scania. Skånetrafiken has lead the measure with involvement of several partners. Municipality of Malmö, a principal participant, is a public relation consultancy firm. They were active within this process by producing material and ideas. It is a firm that works close to Skånetrafiken and City of Malmö in other measures as well. ID Kommunikation, an occasional participant, is a marketing consultancy firm producing material such as DR-marketing campaigns and information. Regional public transport committee decides the budget of Skånetrafiken. Public transport users in Malmo as well as commuters from others cities in Scania who commute to and from Malmö are affected by this measure. Veolia Transport and Arriva are bus operators. For marketing campaigns to succeed there needs to be a coordinated approach amongst all relevant stakeholders to providing marketing and promotional activities. Marketing of a new bus rout system can also benefit from political support. It is necessary for public to become aware of the new bus services.

Components relevant to transferability of measure 8.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				Public transport providers need to be willing and able to promote and participate at necessary marketing activities required for successful operation of such schemes.
Awareness and Communications				
	Awareness and acceptance	High	0	The objective was to see how the bus route change was marketed to the general public and if the general public accepted the change or not. The objectives were set for the group of frequent travellers, those using public transportation in Malmö more than once a week: 1. 95 % shall know about the traffic diversion 2. 90 %shall know how it effects their travel route 3. 60 % shall know why the change is implemented Between 400 and 600 telephone interviews were conducted before and after the implementation of the new bus routes on 12 June 2005. Telephone interviews were also conducted in April 2006 after a direct marketing campaign in two residential areas was conducted. Awareness level of Objective 1 was close to achieved in full, whereas Objectives 2 and 3 were not achieved. It is deemed that the objectives were very ambitious. There has been an increase in bus usage which could be a result of the new bus routes and marketing activities. In March 2006 Skånetrafiken conducted a direct marketing campaign in two residential areas in Malmö. To see if campaign material was noticed by the residents and if the information had any impact on their travel behaviour by bus, telephone interviews were conducted in these areas. According to the measure evaluation, marketing campaigns in themselves have had an impact on travel behaviour and the total increase in number of passengers, but since the main part of the marketing activities coincided with the actual change in travel opportunities, it is impossible to know the relative effects of the marketing versus the actual change.

Components relevant to transferability of measure 8.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				Well planned marketing and consultation exercises can raise the level of awareness and acceptance amongst population. Transferability can be successful where marketing campaigns are effective in reaching the travelling public and where there is strong support from transport providers and public authorities. Also, appropriate survey process and evaluation methodology needs to be developed and used to determine the increase in levels of awareness and acceptance.
Wider Issues				
	Culture . lifestyle	Low	0	Marketing and information strategy can be further developed to form part of wider local and regional transport strategy and policy to encourage uptake of similar measures in other cities and towns. It may be beneficial to promote the new bus routes together with other modes of public transport at all interchanges to achieve modal shift and wider usage of public transport.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 4 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	90,289	3,365,405	3,624,075	168,381	168,381
Year 2	0	452,656	3,624,075	3,171,419	3,339,800
Year 3	0	7,923	1,812,037	1,804,114	5,143,914
Year 4	0	3,135	1,812,037	1,808,902	6,952,816
Total	90289	3829119	10872224	6,952,816	
NPV	87236	3684036	10098074	6326802	
Average net present annual cost				1581700	

Adjusted to Euros, allowing for purchasing parity conversions					
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	
Total	8083	342776	973263	622404	
NPV	7809	329789	903962	566365	
Average net present annual cost				141591	

The indicators chosen and monitored for measure 8.1 (focusing on awareness and service patronage) are not directly suited to cost effectiveness evaluation.

3.1.8 Measure 8.2: Improved Security and Safety on Buses

In Malmö problems exist with security and safety on buses. Violence, threats and robberies have become more common in addition to problems associated with vandalism and damage on buses on certain routes. There was a need for a security strategy to make public transport safer, especially for the drivers, but also more attractive to the passengers.

After political approval and as part of the security strategy all city buses in Malmö (approx 185 buses) were equipped with security cameras during 2006.

Key Results

Summary of key evaluation results:

- Security and safety for public transport travellers are of great importance. Perceived risk keeps people from travelling by bus, mostly in the evenings (presumably after dark). Quite a large group of travellers have experience from frightening/disturbing situations when travelling by bus, as many as 38% in the survey stated this. Most of these situations happened on the bus.

- When asked to measure different factors after their importance on safety and security, the top three were: a calm and safe driving mode, no vandalism on the buses and camera surveillance in the vehicles. It shows that these measures chosen by Skånetrafiken are what the travellers rank the highest when it comes to increase safety and security for public transport.
- After the cameras were installed, more than 60% of the travellers said that this had improved the safety on the buses, and 17% said that they travelled more as a result of the cameras.
- When compared to other public transport support measures in a survey in Malmo the "willingness to pay" for cameras onboard the buses was relatively high when estimated in a Stated Preference study. The 90%-confidence intervals show a positive value for cameras on the buses for fare price as well as travel time. The best estimate shows a value of 12% of the price for a monthly ticket in return for the additional security afforded by the cameras.

Recommendations

- Recommendation 1 – The installation of security cameras has been carried out as part of a wider security strategy developed to enhance personal security and safety on the buses and to lower damage in the buses. This is recommended from many perspectives, not least because the evaluation in Malmo and other locations, shows that personal security and the perception of safety as judged by the appearance of the vehicles, as key barriers for some people that stop them travelling by bus.
- Recommendation 2 – Ensure that the security strategy is continuously developed to take into account the results of any monitoring and evaluation work conducted as a basis for further developments and validation of the approach taken.
- Recommendation 3 – Make sure all actors at the local / regional level have an involvement, to include politicians in the initial decision making process to head off any personal privacy issues. This should also include involvement of all institutional actors as the benefits are likely to accrue to all participating organisations, including many from the wider community such as the police and other public services who should benefit from a lower level of calls as a result of incidents on public transport.
- Recommendation 4 – If political resistance is likely to be a barrier then take a step by step approach to prove the concept on one bus line first.
- Recommendation 5 – A degree of training will be required for those who need to be involved in the maintenance, monitoring and response to incidents observed, which will require appropriate procedures to be in place, agreed with the police etc..
- Recommendation 6 – Ensure compliance with national legislation. This type of system has been tested extensively in the UK, but does require signs to be visible informing people that security cameras are in use because of the national law on civil liberty. (The idea being that anybody that doesn't want to be filmed on the bus they have the opportunity of travelling by a different mode, whilst those who consider the security cameras to be a good thing for security will be encouraged to travel.)

Transferability

This measure requires a coordinated approach of various stakeholders to ensure its success and provision of wider benefits including improved safety on public transport, modal switch and increase in public transport usage and wider environmental benefits. Questions of personal privacy need to be taken into consideration when planning similar projects. This measure has a strong potential for transferability and should also be encouraged to be taken up to improve safety and experience of passengers travelling by public transport and professionals working in public transport.

Components relevant to transferability of measure 8.2	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Strategies and Policies				
	Security Strategy Objectives	High High	1	In Malmo problems exist with the security and safety on buses. Violence, threats and robberies have become more commonplace in addition to problems associated with vandalism and damage on buses on certain routes. There is a need for a security strategy to make public transport safer, especially for the drivers, but also more attractive to the passengers. A security strategy was developed to enhance the security and safety on the buses and to lower damage in the buses. Objectives associated with security strategy are increase the security on public transport, increase the number of journeys by 1%, lower costs for vandalism, increased perception of safety and increased attractiveness of city buses. The strategy is transferable where there is need to improve safety on public transport for the staff and passengers. Many cities already have measures in place to combat vandalism and antisocial behaviour as part of wider security strategies. The security strategies can differ from city to city but they will have a common goal of improving safety on public transport.
Services Offered				
	Security cameras on buses	High	1	As part of the strategy 170 city buses in Malmo were equipped with security cameras due to an increased incidence of vandalism, violence, threats, robbery and stone-throwing etc. to meet the measure objectives. Approximately 4 cameras were installed per bus. This characteristic is transferable where security cameras on buses or public transport form part of security strategy and where resources are available to introduce such service.
Target Population				
	Public within the city of Malmö Bus drivers	High	2	It is the objective of this measure to make the public transport safer and more attractive to the passengers and to male the bus drivers' work environment more secure. This characteristic is transferable as part of the objectives forming security

Components relevant to transferability of measure 8.2	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				strategy to improve safety on buses for both passengers and bus drivers.
Geographical Area Covered				
	The City of Malmö	High	1	170 buses serving the city of Malmo were equipped with security cameras. This characterises is transferable to any city or public transport provider where similar measures are envisaged or needed to improve safety on public transport and make it more attractive to passengers and as a working environment. Success of transferability will depend on the scale of the project, i.e. the number of public transport vehicles equipped with security cameras.
Finances				
	Operating Costs	High	2	Skånetrafiken pays the cost of cameras through its traffic contract with the operators Arriva and Connex. The costs are associated with purchase, installation and running of the cameras on all of Malmo's buses. This characteristic is transferable as there will be costs associated with similar security measures and where there are available resources. It may worth for cities which plan such scheme seeking funding similar to SMILE project.
Stakeholders' Involvement				
	Skånetrafiken Arriva and Connex Public authorities	High	0	Skånetrafiken is the regional transport authority which plays the leading role and has funded the cost of the cameras through its traffic contract with the operators Arriva and Connex. Arriva and Connex are the principal participants as they are the operators of the buses in which the cameras have been installed. Public authorities are involved at various levels in the approval process for this sort of activity and need to be informed about the results of their political decisions using the evaluation results so that their decisions are vindicated. Transferability can be achieved as a concept where there is a coordinated approach to providing similar services. Coordination between different stakeholders can be specific to a particular city and determined by its policies and

Components relevant to transferability of measure 8.2	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				strategies.
Legal or contractual requirements				
	Contracts	High	1	For a successful deployment of such system contractual arrangements exist between public transport authorities and the bus operators. Transferability exists where such contractual arrangements need to be in place for successful running of the project.
Organisational or Institutional Aspects				
	Structure	Medium	0	Institutional structure needs to be in place between all interested parties and well as the approval from the politicians had to be sought to install the cameras on buses. There was a need for formal decision as to allow the buses to have cameras installed with regards to the personal integrity questions and personal privacy issues. A concept like this is transferable but does not necessarily have to be the same. When planning similar projects the cities authorities and public transport providers can set up the organisational structure best suited to their requirements and successful implementation of similar projects.
Awareness and Communications				
	Awareness and acceptance	High	0	According to measure evaluation after the cameras were installed, more than 60% of the travellers said that this had improved the safety on the buses, and 17% said that they travelled more as a result of the cameras. Transferability needs to be encouraged where similar measures have positive effect on travelling public and improve travelling experience on public transport. Also, appropriate survey process and evaluation methodology needs to be developed and used to determine the increase in levels of awareness and acceptance.

Components relevant to transferability of measure 8.2	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Wider Issues				
	Culture / lifestyle	High	0	There has been an increase in people using public transport in Malmo and therefore the public transport operator felt the need to install the cameras to ensure the safety of the passengers. It is important to make sure all actors at the local and regional level have an involvement in the project, including politicians in the initial decision making process to head off any personal privacy issues. This should also include involvement of all institutional actors as the benefits are likely to accrue to all participating organisations, including many from the wider community such as the police and other public services who should benefit from a lower level of calls as a result of incidents on public transport. Transferability needs to be encouraged where measures have a security benefits for a wider population using public transport.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 4 years					
Year	Expenses: Set-up Costs (Fixed Cost)	Expenses: Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	3,240	60,031	0	-63,271	-63,271
Year 2	0	40,877	0	-40,877	-104,148
Year 3	0	10,832,709	0	-10,832,709	-10,936,857
Year 4	0	98,895	0	-98,895	-11,035,752
Total	3240	11032512	0	-11,035,752	
NPV	3130	9952824	0	-9955955	
Average net present annual cost				-2488989	

Adjusted to Euros, allowing for purchasing parity conversions					
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	
Total	290	987612	0	-987902	
NPV	280	890960	0	-891240	
Average net present annual cost				-222810	

The indicators chosen and monitored for measure 8.2 (focusing on service perception and patronage) are not directly suited to cost effectiveness evaluation.

3.1.9 Measure 8.3: Integration of Cycling with Public Transport

With 390 km of bicycle lanes, an ambitious Bicycle Program, a climate and topography well suited for bicycle traffic, coupled with the fact that most residents (over 90 %) in Malmö have a bicycle at their disposal it is clear to see that Malmö is a leading European city when it comes to the infrastructure for and use of bicycles. Prior to SMILE more than 20% of all journeys in Malmö were done by bicycle, and for journeys to and from work the figure is even higher.

While in the original project description the emphasis was on better integration of cycling and public transport at for example the Central Station and the Södervärn nodes in the network, changing circumstances and the construction of the tunnel itself as well as decisions independent of SMILE to renovate and change the Central Station complex led to significant changes in the emphasis and actual execution of this measure. The focus of the evaluation was concentrated on the tasks actually delivered, which included:

- Bicycle detectors: The majority of traffic lights in Malmö are equipped with buttons which cyclists and pedestrians may push to get a green light. Prior to SMILE cyclists were forced to stop and get very close to car traffic in order to press the buttons, which is inconvenient and exposed the cyclist to potentially dangerous situations. During SMILE a system of bicycle radar was tested, demonstrated and evaluated at 20 intense high-risk intersections in the city of Malmö.

- Demonstration bicycle lane: Two existing bicycle lanes on busy bicycle routes have been further developed into demonstration bicycle lanes. These lanes were then evaluated in terms of safety, security, lightning, signs, comfort etc.
- Information and marketing activities: Information materials were created for and campaigns were carried out during the project. These include material concerning safe cycling and the health effects of cycling. Marketing of cycling was also carried out through campaigns where the information materials and alternative marketing techniques were used. Thematic bicycle maps (culture tour, nature tour etc.) were produced in Swedish and English and then distributed free of charge. Through these activities the City of Malmö promoted cycling as a serious mode of transport. Two bicycle barometers[11] were installed at two busy bicycle roads.

Key Results

Summary of key evaluation results:

- Bicycle radar detectors led to some changes, despite limitations in use – The introduction of bicycle radar detectors has lead to some reduction in waiting time, perhaps as much as 3 seconds per cyclist under favourable circumstances. However the majority of bicycle trips in Malmö are not affected by this change because the detector system is disabled during peak travel hours. Furthermore, cyclists travelling through multiple intersections with detectors may achieve greater average speeds by as much as 2 km/h under favourable circumstances. These results would need more study for confirmation.
- Cyclists awareness of demonstration lanes – Most cyclists using the demonstration lanes are frequent cyclists. They appear to recognise two main improvements in the demonstration lanes: the widening of a bridge and the construction and improvement of a tunnel (tunnel construction was actually pre-SMILE) but the majority of smaller activities that are part of the enhancement process characterizing these demonstration lanes has been relatively unnoticed by the majority of cyclists. This lack of awareness may be in part a function of this part of the measure being behind schedule and not complete when the evaluation was conducted but also may be a function of respondents not seeing the series of improvements as part of an integrated process.
- Perceptions of cycling – Generally the public believes that there has been little change in terms of safety, speed, convenience and sign posting for cyclists during the past year in Malmö. Of those that have perceived a change the change has been mildly positive. This result is likely to have been influenced by the good starting point in respect of cycling in Malmö.
- Campaigns to promote cycling – Some 40-50% of the city of Malmö has been reached by the major campaign, judging by the response to a telephone survey held shortly after the campaign. This campaign had small return or repeat exercises during the Autumn of 2007 and late May 2008. About 18% of the population of Malmö still recalled being reached by this major campaign Inga löjliga bilresor to promote cycling. One year on perhaps as many as 11-12% of the public can identify one or more of the central messages in the campaign. As many as 8% of the public may claim that they have been affected by the campaign, based on a survey conducted more than one year after the campaign started. Between 1-2% of the public say that they have been greatly

[11] A bicycle “barometer” is an intelligent bicycle measuring device that combines sensors and a display of daily and yearly traffic.

affected by the campaign. This suggests a good result for raising awareness and the acceptance of the message of the campaign. This demonstrates a high degree of retention of the acceptance of the campaign through time. However, this does not necessarily automatically lead to changed behaviour and a measurable modal shift towards bicycling.

- Wider effects – At the city level it is likely that the impacts at the level of the measures implemented will be marginal and have the effect of embedding cycling as an accepted transport mode, rather than leading to measurable energy or environmental impacts.

Recommendations

- Recommendation 1 - it is recommended that measuring the increase of cycle journeys as a result of the measure implementation is included in measure objectives and should tie in with wider transport monitoring activities and transport models.
- Recommendation 2 – marketing campaigns and activities for promotion of cycling should become strategic and policy driven to form part of the local and national transport policy to encourage uptake of similar measures in other cities and towns.
- Recommendation 3 – For the success of this measure it is important that soft and physical measure solutions are complementary, i.e. marketing as a soft improvement measure should have a holistic approach to promoting the benefits of cycling including the promotion of new build cycle lanes, cycling facilities and public transport interchanges to achieve modal switch from cars to bicycles. This could involve targeting campaigns in the areas around new infrastructure or for particular types of trips.

Transferability

There is a potential for transferability of this measure or the concept of the measure. A concept like this is transferable but does not necessarily have to be the same. When planning similar projects the cities need to take account of their specific infrastructure requirements and decide what would suit them best to achieve the successful implementation and running of the project. This needs to be complemented by a good marketing approach to ensure raising awareness and acceptance and promotion of cycling and all its associated benefits.

Components relevant to transferability of measure 8.3	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Strategies and Policies				
	Marketing and campaign strategies	High	1	This is a new soft measure solution to develop consistent and coherent marketing and campaign strategy to promote bicycle usage. Previous work has tended to be piecemeal and carried out in isolation from other transportation activities. This measure will develop and test such marketing and campaign strategies that can be easily repeated on a yearly basis so that general awareness of these campaigns and marketing will increase. Marketing campaigns and activities for promotion of cycling should become strategic and policy driven to form part of local and national transport policy to encourage uptake of similar measures in other cities and towns. Potential for transferability is where support for increase in cycling exists and the will to develop and conduct marketing campaigns to raise awareness and acceptance of bicycle usage.
Services Offered				
	Two high security bicycle parking facilities located at the Central Station and at Södervärn	Low	1	The two high security parking facilities will not be built within the CIVITAS-SMILE timeframe as the work on the tunnel for the railway with two new stations in Malmö and the expansion of the original Central Station has made the timeframe for the high security parking facilities too narrow. An implementation at this stage would mean that no long lasting gains would come from their construction. However, good bicycle conditions are crucial to succeed to get car drivers to choose bicycles instead. To support the combination of bicycle and public transport it is important to reach a fully intermodal transport system Potential for transferability exists where there is support for intermodal transport system and where the existing infrastructure at main stations allows for the provision of bicycle parking facilities.
	Bicycle detectors	High	0	To improve cyclists' safety and convenience as well as reduce cycling times the cycle radars at about 20 intersections with street traffic were installed. The majority of traffic lights in Malmö are equipped with buttons which cyclists and pedestrians may push to get a green light. Prior to SMILE cyclists were forced to

Components relevant to transferability of measure 8.3	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				stop and get very close to car traffic in order to press the buttons, which is inconvenient and exposed the cyclist to potentially dangerous situations. During SMILE a system of bicycle radar will be tested, demonstrated and evaluated at 20 intense high-risk intersections in the city of Malmö. It important to note that this solution is very expensive and bicycle radar detection in crossroads has not been tested before. An alternative would be to install radar detection at the busiest intersections. Also, the bicycle radars are only operational at certain times, mainly off-peak, so as to reduce conflict with busy periods of traffic flow. This means that the majority of cycle flow does not benefit from the radar detection system. It is difficult to gauge the extent of the transferability potential for this element of the measure. For the system to be rated successful further testes on it would need to be conducted in Malmo. However, when considering application of the similar bicycle radar system elsewhere it is necessary to have strong financial support as well as decisions on the exact locations and timing of the cycle radars to minimise potential conflict of increased congestion for cars and buses.
	Demonstration bicycle lanes	High	0	Two existing bicycle lanes on busy bicycle routes have been further developed into demonstration bicycle lanes and evaluated in terms of safety, security, lightning, signs, comfort etc. One of the existing lanes runs close to or through one of the public transportation nodes to emphasis the connections with public transport in the original project description. The demonstration bicycle lanes have important demonstration values for this measure. Transferability potential exists where similar objectives are considered for integration of cycling with public transport and where there is an adequate provision of capacity and relevant infrastructure.
	Information and marketing activities	High	1	The two high security parking facilities will not be built within the CIVITAS-SMILE timeframe as the work on the tunnel for the railway with two new stations in Malmö and the expansion of the original Central Station has made the timeframe for the high security parking facilities too narrow. An implementation at this stage would mean that no long lasting gains would come from their

Components relevant to transferability of measure 8.3	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				construction. However, good bicycle conditions are crucial to succeed to get car drivers to choose bicycles instead. To support the combination of bicycle and public transport it is important to reach a fully intermodal transport system Potential for transferability exists where there is support for intermodal transport system and where the existing infrastructure at main stations allows for the provision of bicycle parking facilities.
Target Population				
	People travelling in Malmö, including travellers by car, bus and cycle, living in the city as well as visitors	High	1	There is high proportion of bicycle ownership in Malmo (90%) and relatively high proportion of cycle journeys (20%) which is encouraging when promoting cycling measures. Cycling as a mode of transport can be further supported because even though the level of bicycle use is relatively high, there is still a gap between use and ownership that provides potential for further bicycle use. Also, to achieve modal switch car drivers needs to be encouraged by co-ordinated marketing activities to take up cycling. Transferability potential exists where there is strong support to promote cycling and where measures are being taken to offer good provision of cycling facilities. People's travel behaviour and need for travel also need to be taken into consideration to determine the likely levels of modal shift.
Geographical Area Covered				
	City of Malmö	High	1	The city of Malmo is the target area for this measure. This characterises is transferable to any city willing to promote cycling and integration of cycling with public transport in a similar context and where there are resources available to introduce such service.
Finances				
	Financing of the measure	High	1	Operational costs are associated with demonstration bicycle lanes, marketing and information activities, improving safety and comfort at crossroads, investigating safety parking facilities. Operational costs are 1212757EUR. This characteristic is transferable as there will be costs associated with

Components relevant to transferability of measure 8.3	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				establishing and running of similar scheme. It may worth for cities which plan such scheme seeking funding similar to SMILE project.
Stakeholders' Involvement				
	People travelling in Malmö, including travellers by car, bus and cycle, living in the city as well as visitors.	High	1	There is a pre-existing high proportion of bicycle ownership in Malmo (90%) and relatively high proportion of cycle journeys (20%). Transferability exists for similar target groups displaying willingness to take up cycling. Marketing and consultation can help attract and retain new bicycle users.
	Malmö stad, local/regional administration	High	1	Malmö stad, local/regional administration has a leading role in the project. These authorities can offer strong support for such measures and their application. Transferability exists where the authorities offer their support and influence their decision for uptake of such measures.
	Skånetrafiken transport / traffic department	High	1	Skånetrafiken transport / traffic department is a partner in marketing and information activities. Transferability can be achieved where there is an organisation which as able and willing to introduce such measure.
Awareness and Communications				
	Cyclists awareness of demonstration lanes	High	0	The survey was asking cyclists on the demonstration lanes about their general cycling habits, their opinions about cycling in Malmö in general, and their awareness and opinions of specific features and improvements in the demonstration bicycle lanes. Most cyclists noticed two main improvements in the demonstration lanes: the widening of a bridge and the construction and improvement of a tunnel (tunnel construction was actually pre-SMILE) but the majority of smaller activities that are part of the enhancement process characterizing these demonstration lanes have been relatively unnoticed by the majority of cyclists. This lack of awareness may be in part a function of this part of the measure being behind schedule and not complete when the evaluation was conducted but also may be a function of respondents not seeing the series of

Components relevant to transferability of measure 8.3	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				improvements as part of an integrated process. Transferability of such a survey can only be achieved if it is conducted in a similar context and has similar objectives.
	Campaigns to promote cycling	High	1	40-50% of the city of Malmö population have been reached by the major campaign. Results suggest raising awareness and the acceptance of the message of the campaign. However, this does not necessarily automatically lead to changed behaviour and a measurable modal shift towards bicycling. Transferability has a potential where well planned marketing and consultation exercises can raise the level of awareness and acceptance amongst population.
Wider Issues				
	Measures and their application on city level.	Low	0	At the city level it is likely that the impacts at the level of the measures implemented will be marginal and have the effect of embedding cycling as an accepted transport mode, rather than leading to measurable energy or environmental impacts. Transferability is not appropriate unless cycling can become more prominent mode of transport with good interchange facilities with other modes of transport.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration:	15 years				
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	740,000	5,000	0	-745,000	-745,000
Year 2	1,038,000	20,000	0	-1,058,000	-1,803,000
Year 3	3,275,000	40,000	0	-3,315,000	-5,118,000
Year 4	3,600,000	150,000	0	-3,750,000	-8,868,000
Year 5	0	200,000	0	-200,000	-9,068,000
Year 6	0	200,000	0	-200,000	-9,268,000
Year 7	0	200,000	0	-200,000	-9,468,000
Year 8	0	200,000	0	-200,000	-9,668,000
Year 9	0	200,000	0	-200,000	-9,868,000
Year 10	0	200,000	0	-200,000	-10,068,000
Year 11	0	200,000	0	-200,000	-10,268,000
Year 12	0	120,000	0	-120,000	-10,388,000
Year 13	0	120,000	0	-120,000	-10,508,000
Year 14	0	120,000	0	-120,000	-10,628,000
Year 15	0	120,000	0	-120,000	-10,748,000
Total	8653000	2095000	0	-10,748,000	
NPV	7775014	1557893	0	-9332907	
Average net present annual cost				-622194	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	774602	187541	0	-962143
NPV	696006	139460	0	-835466
Average net present annual cost				-55698

Measure 8.3 consists of a rather diffuse promotion of cycling combined with infrastructure improvements in the form of bicycle radar detectors and upgrades to demonstration cycle lanes. The effects of the measures are subsumed within the general impact of SMLE measure and other wider sustainable transport measures within the city of Malmo. Whilst there will have been an impact on emissions from changes in personal transport choices, it has not been possible to isolate such effects for this measure and so no cost effectiveness calculation has been possible.

3.1.10 Measure 9.1: Car Sharing for Business and Private Persons

Despite Sweden's reputation for being an environmental pioneer, the average age among private vehicles (cars) in Sweden is one of the oldest in the EU. Some people in Sweden see no other alternatives to the private car for commuting, errands and recreation.

Air quality norms in parts of central Malmö are exceeded from time to time. The City of Malmö was under pressure from the regional environmental authorities to reduce the number of days and hours per year when the norms are exceeded. The primary cause of the air pollution is traffic. A variety of measures may be required to achieve air quality goals with respect to traffic.

One such measure involves new forms of car ownership and accessibility, introduced through a commercial car sharing service in Malmö called Sunfleet. Through car-sharing, habitual motorists may drive less and those who cannot afford a car can have occasional access to a car at a reasonable and competitive price.

In Malmö previous experience with car-sharing has been limited. This particular measure is important for developing a transport system where citizens are not dependent on traditional private car ownership for all of their mobility. Sunfleet established five car sharing locations in Malmö, available for all kind of users. The entire Sunfleet fleet consists of biofuel/flexifuel cars, electric hybrids and gas-hybrid cars.

Key Results

Summary of key evaluation results:

- Delivery of a profitable car sharing system – The measure has succeeded in delivering the proposed five site / 15 car system in a profitable manner that has generated interest and enough opportunity for continued expansion; (already to 7 sites and plans for more).
- Using the car sharing system to increase the uptake of clean vehicles – Sunfleet was specifically designed with the intention of providing cars that offer the option of using clean fuels (E85 and fuel gas) and incorporating promotion of these fuels as part of the implementation process. The data shows that in comparison with a likely near 100% petrol baseline, the energy mix of the Sunfleet cars has been 25.6% gas, 40.9% petrol, 33.5% E85. However, it is also clear that promotion and availability of these fuels are key to success.
- Resulting reduction in vehicle emissions – By virtue of the shift from petrol to other fuels there appears to be a reduction in emissions from the use of cars in Malmö by:
  - 30,360 kg CO_2 per year i.e. a 42% decrease for the distance covered by participating vehicles
  - 15.06 kg NOx per year i.e. a 60% decrease for the distance covered by participating vehicles
  - 180 g PM_{10} per year i.e. a 12.5% decrease for the distance covered by participating vehicles
- No evidence of a nett change in travel behaviour – Unlike other car share / car club systems there is no evidence that there has been a change in personal travel behaviour away from the use of the private car amongst those who have participated. The evidence is limited due to the small sample of surveys returned, but it appears that Sunfleet may have been more popular among those who did not previously own a car (so offering them greater mobility) rather than among those who previously owned a car and who considered the opportunity to reduce their mobility costs. It appears that the company travel using the system is a straight substitution of use of Sunfleet as compared to their own vehicles, and so is driven by a mix of commercial and subsidiary environmental motivation.
- Continuing opportunities for expansion of the car sharing system – Concrete plans to progress the system further.

Recommendations

- Recommendation 1: Strong organization - Make sure you have a strong organization and sufficient staff recourses. This is particularly important if taking the approach of subcontracting much of the technical skills required from a range of organisations.
- Recommendation 2: Suppliers – Choose your suppliers carefully. Advanced technology and digital solutions are very expensive and need to be able to meet all different increase of demands.
- Recommendation 3: Location and availability of pool site – In the beginning of the project, it is extremely important to pick a strategic good spot for the car pool site – close to both companies and private homes – to get as good use rate over 24 hours as possible. There are a lot of costs involved in the beginning of the project and the number of users at that stage will be small. By doing this availability increases for everyone and costs are lowered. When the amount of users grow it is easier to expand.
- Recommendation 4: Expectations - Since carsharing is still fairly unknown, it might take much longer than expected to implement, particularly in the initial stages. One of the hardest things is to try to change people’s behaviour. Be patient. Younger users have a tendency to grasp and approve of the concept faster.
- Recommendation 5: CIVITAS project – If the opportunity is given – do not hesitate to participate in a EU/ CIVITAS project to be able to start a car sharing site. You are part of a very important work to try to change the transportation industry.
- Recommendation 6: Planning – When planning a new project it is advisable to seek information of similar projects elsewhere and learn from their ‘lessons learned’ logs and reports. This ensures that good practices are used and built upon and any mistakes avoided and thus not repeated.
- Recommendation 7: Market Research – It is recommended to establish whether reasons why people joined the car meet the objectives of the scheme. This will help create an understanding of the measure effectiveness and enable future planning of the scheme in ways to ensure its success. It will also help understand the best methods to attract existing car owners in order to capitalise on the opportunity to reduce the total number of car trips made.
- Recommendation 8 – Integration - When planning future car sharing sites their integration with public transport needs to be considered to promote modal switch and achieve seamless transfer between transport modes. Correct measures also need to be put in place to determine the success of modal switch and increase in car sharing and public transport usage.

Transferability

Sunfleet may be one of Europe’s only “clean vehicle commercial car sharing fleet”. Environmental questions and particularly emissions from traffic contributing to climate change are one of the biggest topics at the moment. The transportation and car industry is working hard to meeting new demands when it comes to pollution. This measure has a good potential for transferability as there many future opportunities to contribute towards a better environment.

Components relevant to transferability of measure 9.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Pollution reduction policy	High	1	This measure isn't defined by a specific policy; however the City of Malmo has been under pressure form regional environmental authorities to introduce measures to reduce air pollution. Traffic is seen as primary cause of air pollution and a variety of measures need to be put in place to improve air quality affected by traffic. Car sharing is seen as a measure which can contribute towards the achievement of air quality goals. Measures associated with environmental policies have potential for transferability provided the cities have recognised similar problems and would have developed similar policies (and strategies) to tackle environmental issues.
	12 measure objectives	Medium (should be High)	0	This measure has 12 objectives the majority of which are simply statements. To gauge the success of a measure its objectives need to be tangible, achievable and measurable and not simply set as statements. The objectives need to be properly researched prior the start of the project to meet the project requirements and enable the evaluation process to correctly measure their achievements and overall success of the project. Even though poorly defined objectives are not recommended for transferability (-1) this shouldn't be seen as a constraint as long as the objectives dealing with similar issues elsewhere are correctly defined, achievable and measurable (+1). Such measures have the potential to influence development of a wider strategy which can contribute to formulation of local and regional policy. This can only be achieved where support exists for tackling issues concerning air pollution and enhancing environmental benefits.
Services Offered				
	Sunfleet 5 car sharing sites and 15 cars using alternative fuels	High	0	All five sites are located in central Malmo with one site close to Regional Transport Authority which could be interesting for partnership working to create wider benefits to users, such as transport integration and seamless passenger transfer between transport modes. The fleet consists of biofuel/flexifuel cars,

Components relevant to transferability of measure 9.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				electric hybrids and gas-hybrid cars. Car sharing service in Malmo is a measure for tackling environmental issues such as air pollution resulting from traffic. It can also help to reduce traffic congestion. This service is transferable as a concept to cities which have similar plans for improving air quality resulting from traffic. However, there are different concepts within which car sharing can be introduced and implemented which are specific to cities and their requirements for such services. For example, in Malmo there are car sharing sites as well as the fleet which runs on alternative fuels. Car sharing itself can reduce the number of private cars and contribute to improved air quality. Car sharing using green vehicles makes the benefits to air quality even greater.
Target Population				
	Company employees	High	0	Companies which are located close to car sharing sites are more likely to use the service and appear to be generally satisfied. Also, companies which use the service wish to be seen to support the initiatives which are beneficial to environment. Many companies nowadays have started their own car sharing. For transferability to work the cities need to engage in marketing activities and awareness raising exercises to attract companies. Also, there needs to be willingness amongst businesses to participate in such projects.
	Private users	High	0	Private users who use car sharing in Malmo do so for a number of reasons, the main being access to the car and cost. With coordinated market approach this characteristic has potential for transferability. Also, it would be worth establishing further reasons of why people might join such schemes and whether they meet the objectives of the schemes. This will help create an understanding of the measure effectiveness and enable future planning of the scheme in ways to ensure its success.
Geographical Area Covered				
	City of Malmö and	High	1	5 sites are located in the city centre and Sunfleet is expanding to suburbs.

Components relevant to transferability of measure 9.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
	suburbs			This characterises is transferable to any city willing to adopt car sharing in a similar context and where there are resources available to introduce such service.
Finances				
	Operating costs	High	2	Operating costs are the costs for the vehicle and the fuel as well as recurring costs required for successful operation, including for example a periodic car wash. They do not include staff costs. This is because personnel involved in Sunfleet in Malmö have also worked for the establishment of car-sharing in other places in Skåne and because staff in the national office have assisted the manager in Malmö. Furthermore, local staff at Hertz have also provided occasional assistance. There may be future costs associated with expansion plans. Costs are different for each site. This characteristic is transferable as there will be costs associated with establishing and running of such scheme. It may worth for cities which plan such scheme seeking funding similar to SMILE project.
	Revenues	High	2	Operating revenues include revenues from the subscription by users plus the revenues from the use of each car per time unit and km driven. Revenue is different for each site. At the moment the scheme is profitable. This characteristic is transferable as it is in operators' interest to recover the costs and achieve certain levels of income for commercial schemes. This should also apply to fully subsidised schemes.
Human Resources				
	Staff.	High	1	It is imperative when starting and running a project like this to have all staff, CEO, managers, administrative support, technical staff, who are loyal, passionate and persistent. Malmo has had a high turnover of sales and marketing managers which slowed the project. This characteristic is transferable provided the staff displays sufficient amount of enthusiasm and dedication. Schemes like this are relatively new and require a passionate team to succeed and set the trend for future projects.

Components relevant to transferability of measure 9.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Stakeholders' Involvement				
	Malmö Högskola	High	0	Throughout the project Malmö Högskola has participated by helping Sunfleet to define indicators for the evaluation stated in the inception report, conducting surveys, making questionnaires etc. This characteristic is transferable where an academic organisation exists which is willing and able to support the set up of such measures.
	HM Skåne	High	1	This is an organization driven by different companies and government organizations within the transportation business. Their line of work is to promote Sustainable transportations. A couple of persons at HM Skåne have followed Sunfleet with great interest during the project in Malmö and have done what they can to help and further promote the car sharing business in the area. This characteristic is transferable as a concept but does not necessarily have to comprise of the same set up. Any authority willing to promote sustainable transportation and promote its application can make a contribution to such projects.
	Users and customers.	High	1	The users and the customers of Sunfleet have taken great part in promoting the car sharing concept in Malmö. They have also been given opportunity to help out with ideas to further develop a successful concept. The users are often seen as best "ambassadors". Transferability exists when there are similar user groups willing to use car sharing. Marketing and consultation can help attract and retain private users.
	Media	High	1	The local media showed great interest in the concept when it first started in spring 2006. Since Sunfleet has had a lot of personnel loss, the work to try to get the attention of media failed for a long time. Media in Malmo is interested in sustainable transport issues and Sunfleet sees opportunities to work with media to promote the measure. This characterises has a potential for transferability where the media shows interested in reporting on sustainable transport initiatives. Media can be a very good marketing tool to help projects like this to develop and expand, attract users

Components relevant to transferability of measure 9.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				and promote sustainable transportation.
	Private and public companies	High	1	A selection of organisations provide services necessary for Sunfleet to function in a co-ordinated way. There are 9 private companies associated with this measure providing a range of services: website and online booking systems, telematic boxes in cars, car cleaning, 24 hour helpdesk, car repairs, telecommunication services to cars. Further 3 marketing companies provide marketing and advertising and a public company provides parking spaces. Transferability can be achieved where there is a coordinated approach to providing such services and where companies exists which are willing and able to provide necessary services required for successful operation of such schemes. However, cities may favour a different approach to providing the support services which reflect their specific needs and requirements for running similar project.
Legal or contractual requirements				
	Contracts	High	1	Contracts would have set up between Sunfleet and their subcontractors to provide the necessary support services. Transferability exists where such contractual arrangements need to be in place for successful running of the project.
Organisational or institutional aspects				
	Structure	Medium	0	Innovative projects require a strong organisation structure and dedicated team to be successful. Sunfleet is a small company which has had staffing problem. Although now successful, there was a period when the project was very slow. It is important to have a strong organization and sufficient staff recourses particularly when subcontracting much of the technical skills required from a range of organisations. A concept like this is transferable but does not necessarily have to be the same. When planning similar projects the cities can decide what management and

Components relevant to transferability of measure 9.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				operational structure would suit them best to achieve the successful implementation and running of the project.
Technical requirements				
	Telematics	High	0	A unique telematic device is installed in every vehicle, enabling a wireless link between cars, cell-phones and the Sunfleet database server. The telematics technology in the cars is very advanced and requires a strong supplier that can meet future growth and demands. Transferability exists where cities which plan such schemes decide to adopt the same technology.
	Online booking system	High	1	The advanced technology behind the Internet booking interface and the database administration management is owned and operated by Sunfleet. Transferability has a high potential as online booking systems are usually user friendly, efficient and have a high usage. Companies also prefer them to more traditional concepts of offering a purchase of a service. However, transferability does not necessarily have to follow the same concept of ownership. On line booking system could be outsourced or kept in house, depending on the management and operational structure of each service provider.
Implementation and management aspects				
	Clean vehicles	High	0	Sunfleet was specifically designed with the intention of providing cars that offer the option of using clean fuels and incorporating promotion of these fuels as part of the implementation process. When setting up similar schemes an alternative fuel car fleet offers better solution to tackling air pollution. Transferability has potential where cities have resources and willingness to use clean vehicles for provision of similar transport services. □

Components relevant to transferability of measure 9.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Awareness and Communications				
	Awareness and acceptance	High	0	For reasons that are complex and not readily understood by Sunfleet or the evaluation staff, many people and organizations in Malmö have not been as interested in the car sharing concept as people and organisations in larger or similar sized cities in Sweden. The car sharing concept is a new idea that many never heard of. The expectations about the amount of work required to market the measure and the resulting success were based on experiences in the establishment of car-sharing elsewhere. Malmö proved initially to be more difficult. Sunfleet found it very time consuming to assure people that it is all right to change their behaviour when it comes to transportation. Although this characterises appears to show constraints for transferability, well planned marketing and consultation exercises can raise the level of awareness amongst population. Media can also act as powerful marketing tool by broadcasting positive messages about sustainable transport and its environmental and health benefits to attract people’s attention and increase awareness. Transferability therefore does have potential.
Wider Issues				
	Culture / lifestyle	Low	0	Sunfleet in Malmo is finding it difficult to attract people to use car sharing for reasons it does not fully understand, especially as car sharing seems popular elsewhere in Sweden. It also recognises that the Malmo market is quite difficult. The measure template doesn’t seem to offer an explanation of why this is particular to Malmo. When introducing a pioneering measure like this it may take some time for people to change their travel behaviour and start using the service. This is a long process which requires cultural shift towards understanding and appreciating the benefits of sustainable transport. Also, the integration with public transport needs to be considered to promote modal switch and achieve seamless transfer between transport modes. Potential for transferability exists where awareness of environmental issues is

Components relevant to transferability of measure 9.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				present and people have the opportunity to make choices as to what modes of transport to use. Also, using the green alternatives to conventional private transport can be seen as a good thing or a trendy thing to attract more users.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 8 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	607,330	866,880	250,000	-1,224,210	-1,224,210
Year 2	946,140	1,083,600	540,000	-1,489,740	-2,713,950
Year 3	1,554,700	1,548,000	1,500,000	-1,602,700	-4,316,650
Year 4	2,845,070	1,720,000	2,000,000	-2,565,070	-6,881,720
Year 5	0	1,720,000	2,000,000	280,000	-6,601,720
Year 6	0	1,720,000	2,000,000	280,000	-6,321,720
Year 7	0	1,720,000	2,000,000	280,000	-6,041,720
Year 8	0	1,720,000	2,000,000	280,000	-5,761,720
Total	5953240	12098480	12290000	-5,761,720	
NPV	5351589	10249713	10243193	-5358108	
Average net present annual cost				-669764	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	532924	1083035	1100180	-515779
NPV	479065	917537	916953	-479649
Average net present annual cost				-59956

Based on the annual equivalent reductions in emissions for the situation at the start of year four of the project, i.e.

- 30.36 tonnes CO_2 per year
- 15.06 kg NOx per year
- 180 g PM_{10} per year

the cost effectiveness values would be:

- 22061 SEK / tonne CO_2 or €1975 / tonne CO_2.
- 44473 SEK / kg NOx or €3981 / kg NOx.
- 3721 SEK / g PM_{10} or €33.3 / g PM_{10}.

An outline assessment of the expected growth and impact of the system suggests that the annualised cost will remain of the same order of magnitude as the system grows over the next four years, whilst the impacts of the scheme would be expected to double as new members join the scheme. This would halve the cost effectiveness values, but is of course based upon an untested business hypothesis.

3.1.11 Measure 10.1: Freight Driver Support

Malmö LBC is a major player in the Malmö goods transport market, operating 150 vehicles a day in the city of Malmö, as well as on long distance. It has access to 250 heavy goods vehicles and 300 drivers, organized under 180 independent vehicle-owner companies.

The business is divided into three main business areas: long-distance distribution, express delivery services, and crane and construction services. The type of goods is full-load, mainly construction material, food and drink products, and pharmaceuticals. Malmö LBC has the ambition to lower the environmental impact of their business, such as fuel consumption and related emissions, as well as reducing the number of unloaded kilometres.

For these reasons, Malmö LBC has decided to install a system of vehicle computers that provides data on fuel consumption- and emissions, and other environmental impacts, which can be used to follow up on the drivers driving performance. The same vehicle computers should also be used to provide data that would allow for optimization of goods distribution and transport planning, as well as loading of goods on the vehicles. This would influence on decreasing the number of unloaded kilometres, which also would have positive effects on the environment.

On long distance transports there's not need for optimization, since about 95 percent of the transports are 100 percent loaded. But, there is potential to reduce the unloaded kilometres on the express delivery and distribution services, as well as construction and material transports, where the level of loading is about 60-70 percent. The Malmö LBC expected to be able to increase this level about 10 percent due to better transport planning and real time control of where the vehicles are situated in relation to customers and incoming orders.

After redefinition of the scope from the original plan, this measure tested vehicle computers in seven lorries and evaluate the results, in order to develop the most optimal vehicle computer system to match the needs of Malmö LBC, as described above.

Key Results

Summary of key evaluation results:

- Vehicle computers have the potential to enforce the effects of Heavy Eco-Driving education on reduced fuel consumption and emissions of the greenhouse gas CO_2. Based on results from other similar experiments, it is estimated that they have the potential to reduce fuel consumption of drivers who have received eco-driving by a further 2%. Across the full Malmö LBC fleet this would be the equivalent of 300 tonnes per year.
- The extent to which installation of vehicle computers at Malmö LBC can contribute to environmental benefits relating to more efficient route and transport planning cannot be assessed at the current, early, stage of development as the common systems need more work to be applicable in the real operating environment.

Recommendations

- Relevant, measurable and formalized goals – The goals should be relevant to the expectations of the whole organization, and especially to the vehicle-owners. In other words, the goals should reflect those efficiency gains that the organization expects from the vehicle computers: mainly reduced administrative costs and reduced unloaded kilometres. These goals should be made measurable and formalized from the very beginning of the process. If the target can not be measured today, there should be a plan for how it can be handled and monitored further on, as mentioned under the next bullet.

- Plan for follow-up on performance – There is a critical need to show results of the measure, in order not to lose the vehicle-owners confidence in the system. For example, baseline data unloaded kilometres is lacking today, hence there is a need to figure out how to make follow-up on this variable.
- Action plan for reaching goals – To elaborate an action plan that describes how goals and results are to be materialized, what actions are to be taken and when.
- Definition of roles and responsibilities - The roles and responsibilities should be clearly defined, in terms of who will finance the vehicle computers, as well as the role and responsibility of the supplier versus the customer, in driving the innovation process.
- Clear communication - There is a need for a very clear communication of all the above, from the side of the Malmö LBC. It is needed to make clear to vehicle-owners that there will be no top down implementation or investment in any technique that would not be beneficent for them as a whole.
- Education - A training program for all drivers, as well as administrative staff, should be run as soon as the vehicle computers are installed to avoid distrust and frustration which might jeopardize their acceptance altogether.
- Eco driving – It is recommended to encourage drivers who have participated in the heavy eco driving training programme to continue to practice the learned technique whilst this measure is being implemented, which will yield environmental benefits in terms of reduction in vehicle emissions. Also, it is worth encouraging trained drivers to attend refresher sessions to maintain and expand the knowledge of eco driving and recruiting new drivers to take up the training in heavy eco driving to maximise potential environmental benefits.

Transferability

Transferability of a measure like this is depended upon the availability of required and full specification software technology able to fulfil the measure objectives and to determine the measure success. Forward thinking organisations, especially transport companies and haulage operators, willing to engage in a process of developing innovative solutions to tackling environmental issues also need to offer their support to such technologies. A coordinated approach of many stakeholders is required to ensure the measure success and its full benefits.

Components relevant to transferability of measure 10.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Services Offered				
	Vehicle and driver support	High	0	The measure objective is to establish vehicle/driver support as a concept that enables an efficient and optimal transport planning with a minimised environmental impact on citizens and nature in the city of Malmö. For these reasons, Malmö LBC has decided to install a system of vehicle computers that provides data on fuel consumption- and emissions, and other environmental impacts, which can be used to follow up on the drivers driving performance. The same vehicle computers should also be used to provide data that would allow for optimization of goods distribution and transport planning, as well as loading of goods on the vehicles. This would influence on decreasing the number of unloaded kilometres, which also would have positive effects on the environment. After redefinition of the scope, this measure conducted tests on vehicle computers in seven lorries and evaluate the results, in order to develop the most optimal vehicle computer system to match the needs of Malmö LBC. Transferability exists where the transport companies realise the environmental impacts of their business and are willing to support and take up the measures to reduce their vehicle emissions. To achieve a direct transferability of this measure the necessary resources and computer technology needs to be available.
Target Population				
	Haulage contractors and vehicles connected to Malmö Lorry Centre	High	0	Malmö LBC has the ambition to lower the environmental impacts of their business, such as fuel consumption and emissions related to that, as well as reducing the number of unloaded kilometres. Transferability potential exists where there is willingness amongst businesses to participate in such projects and where businesses recognise their wider benefits.
Geographical Area Covered				
	Malmo city and where Malmo Lorry Centre has activity	High	1	Malmö LBC is a major player in the Malmö transport market, operating 150 vehicles on a daily basis in the city of Malmö as well as on long distance routes. This characteristic is transferable to any city or wider area where there are resources available to introduce such measures and willingness amongst haulage

Components relevant to transferability of measure 10.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				operators to support such measures.
Finances				
	Costs	High	2	Costs are related to the process of selecting, testing and evaluating suppliers, as well as installing vehicle computers in seven vehicles. This characteristic is transferable as there will be costs associated with establishing and running of such scheme. It may worth for cities which plan such scheme seeking funding similar to SMILE project.
	Benefits	High	2	Benefits are not obtainable during the implementation of this measure, since the scope has been reduced and scaled down. Despite this, it is important to point out that, when the vehicle computers are installed in full scale, it will most probably result in economic benefits from both optimized route planning and reduced levels of fuel consumption.
Stakeholders' Involvement				
	Suppliers of vehicle computers Vehicle-owners The collaboration partner Akka Frakt City of Malmö	High	0	Locus and Vehco have been involved in the process of testing and evaluating the vehicle computers. Locus has become a strategically important stakeholder, since Malmö LBC decided to test their computers, the TDX mobile, in seven lorries. In September 2008, Locus and Malmö LBC signed a collaboration agreement to develop a vehicle computer that suits the needs of the transport company. Vehicle-owners are a strategically important stakeholder; they are members and indirect owners of the company Malmö LBC AB. They have to be convinced about the use, benefits and functionality of the measure. The collaboration partner was involved in the first test round of the two computer suppliers. Thanks to this measure, Malmö LBC has the potential to contribute to the reduction targets of CO_2 of the City of Malmö. A co-ordinated approach involving many stakeholders relevant to this measure is necessary to ensure successful implementation of such programmes.

Components relevant to transferability of measure 10.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Legal or contractual requirements				
	Contracts	High	1	Contracts would have set up between Malmo LBC and suppliers of vehicle computers to provide the necessary software technology and equipment. Transferability exists where such contractual arrangements need to be in place for successful running of the project.
Organisational or institutional aspects				
	Structure	Medium	0	Malmö LBC with its 180 individual businesses will be the largest organisation in the transport sector to influence its businesses and take the initiative for a more sustainable traffic situation in Malmö. A measure template also features a set of organisational factors - decision making, communication, attitudes, competences and skills - which are important because of their influence to develop innovations. It is necessary for measure like this to succeed to be supported by forward thinking and integrative organisation with prevailing cooperative culture.
Technical requirements				
	Vehicle computer	High	0	This involved development of a new type of vehicle computer, monitoring in the same equipment both vehicle data for fuel efficiency and transportation parameters necessary for transport planning. Transferability exists where organisations which plan such schemes decide to adopt similar technology and where such technologies are available. Malmö LBC found that none of the vehicle computers was satisfactory on both required parameters: vehicle data and route planning. The difficulties to find a vehicle computer with satisfactory data capacity brought on new dimensions to the process. Also, according to both drivers and managers, the vehicle computers

Components relevant to transferability of measure 10.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				installed in seven lorries have serious limitations. The system is not reliable and the program is not user-friendly, which is time consuming for the drivers. Among various complaints are that the screen is too small, the system is too complicated, for example it is very complicated for drivers to register new orders, the GPS turns off and has to be switched on several times a day. In order to succeed with the installation and get acceptance from the drivers, a more user-friendly software would be required, which would be adapted to the drivers day to day routines and easy to handle for a person that is not used to computers. It would also have the right screen size. The initial aim was to test functionality of the concept of vehicle/driver support by installing vehicle computers in 150 heavy lorries during the project period. In the final version, the measure has turned in to a feasibility study. For the measure to succeed the required full specification software technology needs to be available.
Wider Issues				
	Culture / lifestyle	Low	0	This measure is liked to Measure 11.9 Heavy eco driving. A positive effect of the eco-driving education is the drivers' motivation and general awareness. This has, for example, resulted in significantly reduced levels of damaged goods and vehicle accidents (approximately 20 percent). This increased awareness can be assumed to have positive external effect on society in general, in terms of increased level of road safety. Drivers who have participated at the heavy eco driving training programme need to be encouraged to continue to practice the learned technique whilst this measure is being implemented which will yield environmental benefits in terms of reduction in vehicle emissions. Also, it is worth encouraging trained drivers to attend refresher sessions to maintain and expand the knowledge of eco driving and recruiting new drivers to take up the training in heavy eco driving to maximise potential environmental benefits.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration:	20 years				
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	50,801	0	0	-50,801	-50,801
Year 2	0	541,286	0	-541,286	-592,087
Year 3	0	678,884	0	-678,884	-1,270,971
Year 4	0	1,870,000	0	-1,870,000	-3,140,971
Year 5	0	2,550,000	500,000	-2,050,000	-5,190,971
Year 6	0	2,450,000	600,000	-1,850,000	-7,040,971
Year 7	0	2,450,000	600,000	-1,850,000	-8,890,971
Year 8	0	0	600,000	600,000	-8,290,971
Year 9	0	0	600,000	600,000	-7,690,971
Year 10	0	0	600,000	600,000	-7,090,971
Year 11	0	0	600,000	600,000	-6,490,971
Year 12	0	0	600,000	600,000	-5,890,971
Year 13	0	0	600,000	600,000	-5,290,971
Year 14	0	0	600,000	600,000	-4,690,971
Year 15	0	0	600,000	600,000	-4,090,971
Year 16	0	0	600,000	600,000	-3,490,971
Year 17	0	0	600,000	600,000	-2,890,971
Year 18	0	0	600,000	600,000	-2,290,971
Year 19	0	0	600,000	600,000	-1,690,971
Year 20	0	0	600,000	600,000	-1,090,971
Total	50801	10540170	9500000	-1,090,971	
NPV	49083	8812994	6239397	-2622680	
Average net present annual cost				-131134	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	4548	943538	850424	-97662
NPV	4394	788924	558540	-234778
Average net present annual cost				-11739

The above cost data is a hypothetical assessment based around the Malmo LBC's aspiration of having 50 vehicles (around one third of the fleet) equipped with vehicle computers by the end of 2009. The costs are include the research and set up costs incurred as part of SMILE as well as the anticipated purchase costs of the 50 units, followed by operation over 20 years. Costs associated with the ecodriving which this equipment is designed to support are not included here as they are the subject of a separate measure (11.9). Revenue shown in the cost table is actually the anticipated reduced expenditure on fuel over the lifetime of the equipment.

It is estimated that the annual reduction in CO_2 emissions resulting from the improved driving style supported by equipping one third of the Malmo LBC would be in the region of 100 tonnes per year. Hence the cost effectiveness value is 1311 SEK / tonne or €117.4 / tonne.

One of the aims of the equipment is also to bring about better levels of vehicle loading, but this has not yet been proven and is not included in the above calculation.

3.1.12 Measure 10.2: Satellite Based Traffic Management for SMEs

215215 Transporter AB is a courier company with full service for both light and heavy transportation in the Öresund region. 215215 Transporter AB is operated as a co-ordination hub with associated hauliers bound by contracts to follow the policy and the working practice stipulated by the company. Since 1995 the fleet has grown from three to over twenty vehicles. 215215 Transporter AB is actively engaged in developing more environmentally friendly transport solutions.

The traffic dispatch office registers the orders in their fleet manager programme and sends them out by sms. However, the planning is done manually. To improve efficiency a satellite based GPS system was installed in delivery vehicles. This was followed by installation of handhelds, for a more efficient two-way communication between the traffic-dispatch and vehicles. It was anticipated that by installing the new technique the traffic-dispatch would coordinate the vehicles more efficiently and this would lead to fewer vehicles being able to conduct more tasks and a reduction in pollution and fuel consumption.

Key Results

- The proportion of unloaded trips has decreased according to expectations, from 17% to 15%.
- The level of coordinated loads has increased from 2.0 to 2.3 loads per trip.
- The total number of unloaded kilometres driven has not decreased but increased from 301 to 306 kilometres per week potentially as a result of an increased market share.
- The possibility of increased optimization for a system based on the individual operator is limited, without support from a well designed route planning tool.

Recommendations

- Recommendation 1 – It is recommended to develop a fuller evaluation process and methodology to collect a quality dataset based on a larger sample of data over a longer time period so that the wider environmental and economic benefits and success of the measure can be established.
- Recommendation 2 – to achieve the best benefits from the satellite traffic management system it is recommended 215215 Transporter AB develop a set of management and evaluation techniques to measure the environmental benefits of its operations and ensure further optimisation of vehicle movements as well as promote its services as environmentally friendly with clear environmental benefits.

Transferability

This measure has potential for transferability where there is willingness amongst transportation businesses to use such technologies. The use of clean vehicles supported by eco driving training for the drivers can contribute to the increase in environmental benefits. It may also be in SMEs' interest to use the available communication technologies to optimise and rationalise their transportation services.

Components relevant to transferability of measure 10.2	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Services Offered				
	A satellite based GPS system for 215215 Transporter AB	High	0	215215 Transporter AB is a courier company with full service for both light and heavy transportation in the Öresund region. The company is actively engaged in developing more environmentally friendly transport solutions. A satellite based GPS system was installed in delivery vehicles. This was followed by installation of handhelds, for a more efficient two-way communication between the traffic-dispatch and vehicles. By installing the new technique the traffic-dispatch coordinates the vehicles more efficiently. It was anticipated that this would lead to fewer vehicles being able to conduct more tasks and a reduction in pollution and fuel consumption. This characteristic is transferable where there are companies which are willing and able to embrace such technology and where there are resources available which can support installation and implementation of such systems.
Target Population				
	Traffic dispatch, drivers, customers	High	0	The traffic dispatch office registers the orders in the fleet manager programme and sends them out by sms. The drivers are continually trained in ECO-driving and the company has an ambition to decrease the environmental impact by investing in clean vehicles. The environmental benefits can be achieved where there is an opportunity to increase the proportion of clean vehicles in the company's vehicle fleet and where drivers can receive repeat eco driving training. Customers are expected to benefit from a more efficient service.
Geographical Area Covered				
	The Öresund region	High	1	Customers in the Öresund region are expected to benefit from this service. This characterises is transferable to any where there are companies willing and able to offer such service.
Finances				
	Operating Costs	High	2	Operating costs are the costs of consumables, personnel and subcontracting.

Components relevant to transferability of measure 10.2	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				This characteristic is transferable in that there will be costs associated with the establishment and running of such schemes. It may worthwhile for cities which plan such schemes to cofinance the investment by SMEs in order to reap the benefits.
Stakeholders' Involvement				
	215215 Transporter City of Malmo	High	0	215215 Transporter is private company which has a leading role to implement the measure. City of Malmo has offered support to the project. Transferability can be achieved where there are companies willing to invest in such technologies. Government support can also benefit the project.
Technical requirements				
	GPRS net	High	0	The GPRS net is the third generation technology to handle dataflow over mobile networks (GPS as well as 3G). The positioning system uses the GPRS net to communicate the location of all vehicles to be shown on a map in the company's transport control centre. Transferability exists where there are companies willing and able to use such systems.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 5 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	620,000	170,000	0	-790,000	-790,000
Year 2	0	275,000	260,000	-15,000	-805,000
Year 3	0	260,000	300,000	40,000	-765,000
Year 4	0	270,000	330,000	60,000	-705,000
Year 5	0	260,000	360,000	100,000	-605,000
Total	620000	1235000	1250000	-605,000	
NPV	599034	1109674	1103982	-604726	
Average net present annual cost				-120945	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	55501	110555	111898	-54159
NPV	53624	99336	98827	-54134
Average net present annual cost				-10827

The impact indicators for this measure were focused upon the direct operational benefits for 215215 Transporter AB and it was not possible to directly translate these into energy or emissions impacts at the scale of the project as implemented.

3.1.13 Measure 10.7: Sustainable SME Logistic for the Food Industry

Many SMEs (Small and Medium sized Enterprises) in the food sector have difficulty providing competitive logistics solutions to access optimum markets. Existing logistics systems focus on large flows of a limited number of products whilst demanding a high uniformity on food producers and suppliers that only larger market players can fulfil.

At the same time, there is an increase on the market for high quality fresh products with distinct character and diverse range. The result is that a growing number of SMEs in the local and regional food sector are involved in an inefficient transport system in which small volumes of specialist products are transported rather long distances to the cities, often in the back of the farmer's van, or even in some cases, in the car of the purchaser.

This system is neither economically nor environmentally efficient, and at the same time food miles are becoming an issue of increasing public concern. Studies have shown that organically and locally farmed food can have dramatically lower CO_2 emissions associated with the food itself yet at times these benefits from the food are in eroded or even outweighed" by the high environmental impacts of transporting the food to market and the ultimate consumer.

It is within this context that the idea of a web-based, cost-efficient and environmentally sound co-ordinated logistics solution was born.

Key Results

Summary of key evaluation results:

- The measure implementation has been significantly delayed. This in turn means that the majority of indicators deemed relevant when planning the measure have been impossible to assess within the duration of SMILE.
- In the absence of an extensive full-scale baseline-study, assumptions might have played a too large role in the description of a baseline and of the business-as-usual scenario.
- Scenario projections have shown that substantial reductions in CO_2 emissions are likely if/when the system reaches critical mass.
- 7 out of 10 stakeholders (purchasers and producers of food products) believe that the idea of a virtual market place has a large potential (rather large or very large). Only 2 out of 29 (i.e. less than 1 out of 10) respondents believe that the idea has no potential at all.
- Both awareness levels and acceptance levels are reasonably high, pointing to a rather large potential, but also suggesting that more efforts should be made when it comes to "selling the idea" through information, communication and marketing.
- An absolute majority of the objectives/targets of this measure are more qualitative than quantitative in their nature. This means that also the assessment of the level of fulfilment often is more qualitative in its nature.

Recommendations

- Recommendation 1 – Priority number one when choosing the technical solution should be the end-user. That is, the web tool has to be user-friendly rather than complex. Otherwise the initial barrier might be too high for the potential user.
- Recommendation 2 – Employ committed staff members with the right skills. It is of uttermost importance that skills involving coordination/administration as well as marketing are represented among the staff members.
- Recommendation 3 – Initial efforts put on a well-planned marketing and communication strategy are fundamental. For example, take into consideration that a majority of small-scale food producers are unavailable during their high season. Try to make contact and build networks during winter season (October-March). Do not use e-mail or IT in any form when initiating contacts with producers (and purchasers).
- Recommendation 4 – Early on, plan and conduct a baseline study which can give answers to fundamental questions about preferences among stakeholders, demand and supply structures, and product flow patterns. The target groups are so disparate that there will be a clear need for central co-ordination of a plan and resources in order for the measure to succeed. This is probably a role for a local authority or development agency.

- Recommendation 5 – To make the best impact consider, when contracting a logistics partner for the system, the use of clean fuels (biogas), educated drivers (eco-driving), and skills within the fields of optimised routes and logistics as part of the selection criteria.
- Recommendation 6 – For farmers that want to participate in the system but who lack IT skills/resources/interest/competence consider establishing a system whereby the farmer can complete and submit a paper form with information about produce available to a central service which then types this information into the web tool on behalf of the farmer. Another potential option is to permit farmers to SMS/text message information to a central service and then receive requests via SMS by mobile phone. This attention to the needs and interests of the producer end-user is important.

Transferability

According to the city of Malmö the project is the first of its kind in Europe. Modern IT technology is used to create a professional market place dedicated to the regional food industry, and which will be owned and operated by the partners involved. Thus, the project addresses the growing demand for locally produced food of clear origin with the need to ensure an environmentally efficient transportation of products. This concept has a potential for transferability where appropriate technology exists, where there is a governmental support and where there is a sufficient interest and buy in from the producers and purchasers to use for similar food logistics systems.

Components relevant to transferability of measure 10.7	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Services Offered				
	Food logistics system on the web	High	0	According to the city of Malmo this project is the first of its kind in Europe. The aim is to develop a web-based food logistics system, linking 20-40 small food producers in the region with 2-5 purchasers in the city of Malmö, using co-ordinated transport and clean fuel-vehicles. This logistics tool on the web contains seasonal planner, ordering and confirmation and a transport co-ordination system. This service is transferable as a concept to cities which have similar plans to introduce internet food logistic systems and have the available resources and technical expertise. Also, there needs to be sufficient interest from suppliers and purchasers to engage in and make use of similar food logistics systems.
Target Population				
	Customers interested in quality local organic produce	High	0	Today, customer preference is becoming important when considering the ecological footprint of a certain food product. Within this group we could find hundreds of purchasers. It is however impossible to assess exactly how many might be interested in the regional and local food market. The number seems to be growing over time, following the societal trend. Transferability exists where the consumers and purchasers are willing to use similar food logistics systems and have sufficient awareness and acceptance of their availability and benefits.
Geographical Area Covered				
	Business across city of Malmö purchasing and businesses across Skåne region selling	High	1	The SMEs are interested in selling their products on the regional market in Scania. Malmö being the capital of the region is an important market for many of these producers. In this context the purchasers are defined as stores, shops or restaurants in Malmö interested in regionally produced food as an input to their business. Transferability exists where there is a buy in from the suppliers and purchasers to make this service a viable alternative to conventional food logistics systems and where the local authorities offer sufficient support to introduce and promote

Components relevant to transferability of measure 10.7	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				similar services.
Finances				
	Operating costs	High	2	According to the information on the database, the cost associated with financing of this measure is the staff cost. It is also our opinion that there are costs associated with establishing of the internet food logistics system. This characteristic is transferable as there will be costs associated with establishing and running of such scheme. It may worth for cities which plan such scheme seeking funding similar to SMILE project.
Human Resources				
	Staff	High	0	The issue of personnel within the measure has been characterised by sickness, maternity leave, an initial absence of sales competence, time shortage, and at certain points in time, an absence of commitment. These problems have been dealt with, through both recruitment of new staff, and of consultants. It is imperative when starting and running a project like this to have all staff, managers, administrative support, technical staff, who are loyal, passionate and persistent. This characteristic is transferable provided the staff displays sufficient amount of enthusiasm and dedication. Schemes like this are relatively new and require a passionate team to succeed and set the trend for future projects.
Stakeholders' Involvement				
	Producers of regionally produced food Purchasers of regionally produced food Contracted Logistics Provider	High	0	A coordinated approach to achieving a success and good usage of this measure is required from all stakeholders. It soon became clear that the food producers are extremely hard to get in contact with, when their businesses have their high seasons. Therefore, during the period April-September the measure suffered from a more or less complete absence of commitment when it came to the regional food producers. Furthermore, the problem was enhanced by the fact that the producers often turned out to be less

Components relevant to transferability of measure 10.7	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
	Malmo City Council Skane Regional Council End-users of regionally produced food			frequent e-mail users than the average person. Transferability can be achieved where there is a coordinated approach to providing such services and where companies exists which are willing and able to provide necessary services required for successful operation of such schemes. Also, issue of seasonality needs to be addressed to ensure continuity of the project.
Legal or contractual requirements				
	Contracts	High	1	Contracts would have set up between the city of Malmo and the subcontractor to provide the necessary technical expertise to set up the internet food logistics system. Transferability exists where such contractual arrangements need to be in place for successful introduction and running of the project.
Organisational or institutional aspects				
	Structure	Medium	0	The project aims at creating the right preconditions for more efficient partnerships and agreements within the regional food products market. In this way, more sustainable and efficient transports of the products involved can be foreseen. A concept like this is transferable but does not necessarily have to be the same. When planning similar projects the cities and participating organisations can decide what management and operational structure would suit them best to achieve the successful implementation and running of the project.
Technical requirements				
	IT	High	0	The project requires the provision of modern IT technology to create the internet marketplace. Thus, IT technology is being used to solve a reality-based situation in which supply and demand on a regional food product market can be interconnected.

Components relevant to transferability of measure 10.7	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				Also, the chosen IT solution has over time turned out to be too complex and less user-friendly than was expected. Over the implementation phase several efforts have been made to adapt the web tool. Transferability exists where providers can offer appropriate technical expertise to ensure successful implementation and usage of similar services.
Awareness and Communication				
	Awareness and acceptance	High	0	Both awareness levels and acceptance levels are reasonably high, pointing to a rather large potential, but also suggesting that more efforts should have been made when it comes to selling the idea through information, communication and marketing. Transferability has potential where well planned marketing and consultation exercises can raise the level of awareness amongst producers and purchasers. Media can also act as powerful marketing tool to attract attention and increase awareness.
Gender Issues				
	Female entrepreneurs	High	0	Working actively with female entrepreneurs as over 50% of steering group of business partners are women.
Wider Issues				
	Culture / lifestyle / environmental benefits	High	0	This measure appears to be supported by the societal trends. From almost any viewpoint it is hard to argue with the general idea behind the measure. Furthermore, a strong societal trend, based primarily on the debate on climate change, has supported and reinforced the idea as well as the measure. The societal trends of today are focusing on more climate efficient lifestyles and consumption patterns. Potential for transferability exists and where societal trends are developed to show awareness of a broad range of environmental issues, where people have the opportunity to make choices as to what food logistics systems they can use and also encourage introduction of similar services.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 4 years					
Year	Expenses: Set-up Costs (Fixed Cost)	Expenses: Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	428,622	0	0	-428,622	-428,622
Year 2	179,761	0	0	-179,761	-608,383
Year 3	707,477	0	0	-707,477	-1,315,860
Year 4	706,672	0	0	-706,672	-2,022,532
Total	2022532	0	0	-2,022,532	
NPV	1835864	0	0	-1835864	
Average net present annual cost				-458966	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	181054	0	0	-181054
NPV	164343	0	0	-164343
Average net present annual cost				-41086

As part of the evaluation three scenarios were assessed. The impact scenario 1, which is the current situation is assessed here as the other scenarios will require additional effort (and hence cost) in order to bring about increased participation in the measure.

The estimate of current annual CO_2 reduction is 2 tonnes per year. Cost effectiveness on this basis is 229483 SEK /tonne or €20543 / tonne.

Clearly this is somewhat of a worst case scenario, but as the effort required to bring about wider membership, or indeed an understanding of whether it is possible to achieve this goal, has not been proven, it represents the current situation.

3.1.14 Measure 11.1: Managing Mobility Needs of Private Persons and Business Sector

In this measure mobility management tasks were developed and implemented on a much broader scale than before in the city of Malmö. A wide range of campaigns, projects and interventions were implemented that were intended to provide or enhance information about mobility in general and transport by other means than car, permit households or other groups to “test” new forms of mobility or provide citizens and organisations with tools or experiences that support a modal-shift.

The individual elements of the measure were implemented by two organisations: the City of Malmö and Skånetrafiken – the regional transport authority.

The City of Malmö had the following orientations, strategies and overall target groups.

Influencing local companies

The aim was to influence companies in Malmö to make their transportation of employees and goods more environmentally adapted. SMILE projects in the area of mobility management conducted at the Department of Streets and Parks of the City of Malmö included:

- Arranging seminars for local companies
- Bicycling for companies
- Individual meetings and guidance to companies
- Breakfast meetings in the Western Harbour
- Travel surveys at large companies

Influencing the public

Inhabitants in the city and people commuting into the city every day are included in this part of the measure. Some examples of sub-tasks/activities within this target group are:

- Friendly Way to School/Walk and Go to School
- Bicycle riding courses
- A travel indicator
- A visitors campaign in the Western Harbour area
- The University of Malmö;
  - Promotion of sustainable transportation among employees and students at the Teacher's College area of the university
- Influencing new residents by phone calls and information sent out by post
- A broad communications/dialogue campaign involving the public in discussions about alternatives to cars and sustainable transportation modes

Influencing the municipal organisation

The City of Malmö has about 20,000 employees. Surveys in the past have suggested that approximately 40 % of all employees commute to/from work by car. The primary activity in this sub-task is to:

- Influence the commuting patterns public, city employees and
- Lobby the managers of the various city administration departments to make decisions that help support their employees modal shift away from cars when commuting
- Change the direction of the current municipality travel and transport policy
- Participation in the city planning process
- Development of concepts for sustainable transport modes/systems at the city-wide level

Skånetrafiken's work focused on;

Individual marketing towards employees at private enterprises

The objective of the project was to work with private enterprises to change the transport behaviour of the employees in an environmentally sustainable direction.

- Task 1 – Individual marketing towards employees of private enterprises
  - In the middle of 2006 a larger scale of individual marketing towards employees of private enterprises was implemented. A pilot implementation of a new travel concept called "Skånetrafiken for you" was made. The concept involved a personalized travel homepage offering travellers personal travel guidance, advice, specified timetables, opportunities of charging season tickets etc. The concept and offers were targeted at areas where SMEs are located and where Skånetrafiken have an adequate bus line structure. The method was based on different steps; a letter of introduction to the business executives, visits to interested enterprises, registration of new travellers in a customer database of Skånetrafiken (CRM) and finally individual contacts with the employees.
- Task 2 – Full evaluation – customer views and behaviour of inhabitants of Malmö

The full evaluation for this measure has been documented separately for those elements conducted by the City of Malmö and those conducted by Skånetrafiken. However, these elements are brought together in this section of the final evaluation report.

Key Results

Summary of key evaluation results:

- Success in the various campaigns and activities has varied considerably based on the ambition level, ability of the campaign design to fulfil targets, the degree to which target setting has been based on expectations of actual results, and the ability to measure success. Generally the majority of the campaigns have fulfilled their goals and targets.
- Measurements of awareness and acceptance have been possible in some campaigns but not in others. General awareness of a typical campaign may lie around 20% of the population and acceptance of at least part of the campaign varies between 2-5%. It has only been possible to estimate CO_2 reductions in two of the seven campaigns and because of the diverse nature of the individual campaigns these reductions cannot be extrapolated up to the whole measure.
- The focus on developing an overall personalised customer relationship system for Skanetrafiken and using it to market public transport has been implemented successfully.
- This measure, as part of a wider package, has contributed to the overall modal shift towards bus travel in Malmo, which includes the journey to work.
- The results of the targeted, work-based "Skånetrafiken for you" initiative appears to have had a very strong immediate impact and also a substantial lasting impact.

Recommendations

- Recommendation 1 – The mobility management staff at the Department of Streets and Parks should develop their own form of evaluation methodology, based on the SUMO method, but one where the effects of the projects/campaigns is also included in the evaluation. Projects that cannot be evaluated in terms of effects should be subject to possible change in project delivery and design during the planning process so that the potential to measure or gauge effects is facilitated.. It is important that where the goal of a mobility management project is an actual change in behaviour that this change is directly evaluated, where this is practically possible. In those cases the evaluation of actual change in behaviour is not possible, the project plan should clearly state why and this should then be carried into the evaluation report.

- Recommendation 2 - It is necessary that baselines are set prior to commencement of the project to enable ‘like’ for ‘like’ comparison as well as correct evaluation of achievements of quantifiable targets in C3, because in absence of a baseline it is difficult to evaluate the measure and determine its success as the ‘before’ and ‘after’ comparative analysis cannot be performed correctly.
- Recommendation 3 - To gauge the success of a measure its objectives need to be tangible, achievable and measurable. It is recommended that the objectives are properly researched prior the start of the project to meet the project requirements and enable the evaluation process to correctly measure their achievements and overall success of the project.
- Recommendation 4 - Interpretation of findings without properly defined and measurable objectives and no baseline is a difficult if not impossible task. The actual meaning, interpretation and evaluation of the results are therefore subject to assumptions and guessing. To ensure reliability of data and validity of results the correctly defined objectives and baseline are as important and crucial part of the project as is evaluation process to gauge and determine the success of the project.
- Recommendation 5 – There is a need to set clear, realistic and all-embracing goals, both for individual campaign elements and as part of an overall long term strategy and then make time to review and adjust according to conditions. Review and adjustment should be done using control documents to steer the strategies and measures.
- Recommendation 6 – For a large communications programme there will be a need to have a team of people, or at least a pool of people available, with a variety of competences to cover the range of tasks involved. Also be prepared to develop collaboration, both internally with colleagues and also with the private sector and neighbouring administrations. This could lead to wider effects than originally envisaged at lower incremental cost.
- Recommendation 7 – Ensure internal management supports the work and understand the benefits, especially when implementing new methods within the administration.
- Recommendation 8 – Use a portion of the budget for appropriate pre-research as well as post-campaign testing. Be prepared to test different mechanisms and messages.
- Recommendation 9 – Don’t over-complicate campaigns. Limit and concentrate the projects and do not have too many projects simultaneously. Use simple, easy to remember messages.
- Recommendation 10 – marketing campaigns and activities for managing mobility needs and influencing travel behaviour could become strategic and policy driven to form part of the local and national transport policy to encourage uptake of similar measures in other cities and towns.
- Recommendation 11 – because of the corporate focus of Skånetrafiken this measure has had a public transport focus. Even so, it has had a knock-on impact on use of non-motorised modes. Depending on the institutional framework in different situations it may be equally or more appropriate for this type of measure to be initiated and run by the city authority, which could then widen the focus to include more content on walking and cycling.

Transferability

These activities have a potential for transferability where municipal authorities, transport providers and partnering companies are willing and able to offer and implement mobility management strategies and motivate and encourage employees and user groups to use sustainable transport.

Components relevant to transferability of measure 11.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Physical planning and mobility management strategies	High	1	This measure has combined physical planning and mobility management strategies. The activities within this measure are the activities which are conducted by the Department of Streets and Parks of the City of Malmö as well as activities which can be considered to be the responsibility of that Department. They include various campaigns, projects, etc that are intended to provide or enhance information about mobility in general and transport by other means than car, permit households or other groups to "test" new forms of mobility or provide citizens and organisations with tools or experiences that support a modal-shift. Mobility management strategies are transferable where authorities recognise the need for similar strategies and their associated activities to promote and achieve modal shift.
Services Offered				
	Promoting sustainable transportation system	High	0	Mobility management campaigns and promotion included soft measures such as provision of relevant information, marketing, education and guidance. Mobility management campaigns and promotion included soft measures such as provision of relevant information, marketing, education and guidance. Mobility management tasks were developed to influence local companies, the public and municipal organisation. SMILE permits Malmö to professionalize its mobility management strategies and campaigns into a specific Malmö approach or "brand" which will become increasing recognizable by inhabitants and businesses. The activities within this measure are the activities which are conducted by Skånetrafiken as well as activities which can be considered to be their responsibility. Skånetrafikens measures to support mobility management have the goal of shifting people in their role as employees in organisations towards buses and trains. In the middle of 2006 a larger scale of individual marketing towards employees of private enterprises was implemented. A pilot implementation of a new travel concept called "Skånetrafiken for you" was made. The concept is a personalized

Components relevant to transferability of measure 11.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				travel homepage offering travellers personal travel guidance, advices, specified timetables, opportunities of charging season tickets etc. The concept and offers are sent out to areas where SME are located and where Skånetrafiken have an adequate bus line structure. The method comprises a letter of introduction to the business executives, visits to interested enterprises, registration of new travellers in a customer database of Skånetrafiken (CRM) and individual contacts with the employees. CRM is linked closely to another project "My pages". "My pages" is the interface on the Internet that allows customers to enter their personal data (collected in the customer database), load their travel cards with money (in the future) and choose among the future services in skanetrafiken.se There are different marketing avenues within which mobility management can be introduced and implemented which are specific to organisations and their requirements for such services. This characteristic is transferable as a concept to cities where transport providers support, promote and have plans to introduce mobility management measures.
Target Population				
	Local companies, the public and the municipal organisation	High	0	The primary target groups have been local companies/organisations, the general public, the internal organisation of the city administration. Different stages and concepts of promotional approach were developed for each group. Transferability exists where there is potential for identifying the most appropriate groups which can benefit from mobility management measures and where the promotional activities are designed with particular needs of these specific groups in mind.
	Employees at private enterprises	High	0	The objective of the project is to work with private enterprises to change the transport behaviour of the employees in an environmentally sustainable direction. Transferability potential exists where there is willingness amongst businesses to participate in such projects and where businesses and their employees recognise the benefits of mobility management measures and activities.

Components relevant to transferability of measure 11.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Geographical Area Covered				
	The city of Malmö	High	1	The area concerned is the whole city of Malmo. This characterises is transferable to any city where the local authority and or transport authorities and providers are willing to promote mobility management in a similar context and where there are resources available to introduce such measures.
Finances				
	Operating costs	High	2	Operating costs are the costs for conducting mobility management sub-tasks such as campaigns, seminars, marketing, education and providing guidance. This characteristic is transferable where there are resources available as there will be costs associated with introduction and running of such project. It may be worthwhile for cities which plan such scheme to seek funding from external sources to supplement what are often restricted internal budgets.
Human Resources				
	Staff	High	1	The measure has been driven by individuals that believe in their work, as demonstrated by commitment, energy and passion and which has been supported by key staff members within the organisation. This characteristic is transferable where the staff displays sufficient amount of enthusiasm and dedication. This was backed up by representatives from Skånetrafiken and different companies working together to implement this measure. This characteristic is transferable where the staff displays sufficient amount of enthusiasm and dedication and where employees of different companies can work in cooperation.
Stakeholders' Involvement				
	The municipal organisation	High	1	The municipality of the City of Malmö and Skånetrafiken, the regional public transport authority, initiated and led this measure with involvement of T-Systems,

Components relevant to transferability of measure 11.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
	The regional transport authority The local companies in the city Aspekta PR T-Mobile Local/regional politicians dealing with traffic issues.			Aspekta, ID kommunikation, Strålfors, The city of Malmö, VägVerket, Trivector Traffic AB, Tieto enator. Transferability can be achieved where there is a coordinated approach to providing such services and where organisations exist which are willing and able to provide necessary promotional activities required for successful operation of such schemes. Also, it is necessary that stakeholders and user groups who can benefit from these measures are receptive of their benefits.
Organisational or Institutional Aspects				
	Organisational structure	Medium	0	The Department of Streets and Parks has a long history of building and maintaining infrastructure where softer activities, if ever conducted at all, were short-term exceptional activities. While this began to change a few years prior to SMILE, organisational culture changes only slowly and acceptance of mobility management and how it can help achieve the goals of The Department of Streets and Parks has taken some time. A concept like this is transferable but does not necessarily have to be the same. When planning similar projects the authorities can decide what management and operational structure would suit them best to achieve the successful implementation and running of the project. Gaining politicians' support is very important for developing similar projects.
Implementation and Management Aspects s				
	Management	High	-1	Communications activities such as these require significant staff time input and can be impacted by staff turnover, which hampers incorporating previous lessons learned into new campaigns. Turnover at the top can also have an impact as there is often a need to re-educate a new head of department in the need for

Components relevant to transferability of measure 11.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				communications activities to support transport projects, which are generally delivered and run by people with a technical / engineering focus. Transferability is not appropriate where similar managerial issues can affect implementation and evaluation of the measure.
Awareness and Communication				
	Awareness and acceptance	High	0	Measurements of awareness and acceptance have been possible in some campaigns but not in others. General awareness of a typical campaign may lie around 20% of the population and acceptance of at least part of the campaign varies between 2-5%. As an example, the results of the targeted, work-based “Skånetrafiken for you” initiative appear to have had a very strong immediate impact and also a substantial lasting impact. Increased levels of acceptance and awareness are a good starting point to achieve modal switch and with this environmental and health benefits. Transferability exists where well planned marketing and consultation exercises can raise the level of awareness amongst user groups and population. Also, an appropriate survey process and evaluation methodology need to be in place which can measure increase in levels of awareness and acceptance.
Wider Issues				
	Culture / lifestyle	Low	0	This measure, as part of a wider package, has contributed to the overall modal shift towards bus travel in Malmo, which includes the journey to work which can result in reduced fuel consumption and reduced emissions.. The synergy with the wider package of public transport measures helps to raise awareness and also improves the variety of sustainable transport options that are available for marketing through this type of measure. Marketing campaigns and activities for managing mobility needs and influencing travel behaviour could become strategic and policy driven to form part of the local and national transport policy to encourage uptake of similar measures in other cities and towns. Potential for transferability exists where awareness of mobility management wider

Components relevant to transferability of measure 11.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				benefits is present and people have the opportunity to use alternative transportation arrangements as a result of both promotional campaigns and availability of sustainable transport.

Costs, Revenues and Cost Effectiveness

The total costs for measure 11.1 in Malmö were in the region of €2.2-2.3million. This was split between the City of Malmö, which was responsible for a large number of campaigns aimed at raising awareness of travel choices the impacts of transport on the environment and also specific campaigns aimed at driving a change in behaviour and Skånetrafiken which focused on public transport options in a more targeted manner.

The split of total budget for measure 11.1 between the organisations was:

- City of Malmö: approximately €1.9m
- Skånetrafiken: approximately €0.4m

Note, not all of this will have been spent on directly implementing transport-related communications, as the involvement in a European project will have used a proportion of the budget for reporting, evaluation etc.

The budget associated with the individual campaigns run by the City of Malmö ranged from around €10,000 for smaller or pilot actions to over €100000 for some of the larger interventions.

Because the nature of the campaigns and the degree to which evaluation impacts can be attributed to the campaigns varied significantly from campaign to campaign it is more appropriate to assess the effectiveness of two example initiatives

Example 1: City of Malmö "Companies on Bikes" campaign, which cost 462 284 SEK over a three year implementation period. The overall impact was estimated to be a change in mode from car to bicycle equivalent to a reduction of 26.6 tonnes CO_2. Although, CO_2 reduction is a valid and extremely relevant impact of this measure it must be remembered that it is not the only desired outcome of this type of measure and indeed the high awareness and acceptance rate achieved were considered a success in their own right. However, for the purposes of the cost effectiveness calculation the CO_2 benefit comes to 17379 SEK / tonne CO_2 or €1556 / tonne CO_2.

Example 2: Skånetrafiken "Skånetrafiken for you" campaign in which marketing towards employees of private enterprises was conducted. The cost of this campaign is not specifically attributed within the cost data received for the measure. However, it has been estimated to be approximately €137,000 (i.e. around one third of the Skånetrafiken budget for this task)

To set against the investment budget any success in persuading employees to travel by public transport would result in an increase in revenue for the public transport operators.

The evaluation suggested a range of potential impacts that would correspond to a minimum impact of 127kg CO_2/day to a maximum impact of 232kg CO_2/day. The extent to which the benefits of this type of intervention continue to be felt is a matter of debate. Research for the UK government (Smarter Choices – Changing the Way We Travel) included an allowance for ongoing reductions in subsequent years on the basis that the behaviour change decays by 40% each year following the intervention. When compounded this would lead to the overall impact without some form of refresher campaign being approximately 2.5 times the initial annual impact before the effect is lost. Taking a conservative estimate of the value of the additional revenue generated per trip switched from car to public transport for the minimum and maximum scenarios gives the following figures:

Minimum impact: Cost €136698 less benefit €57500 / CO_2 reduction 73.0 tonnes →€1084.5 / tonne CO_2

Maximum impact: Cost €136698 less benefit €98900 / CO_2 reduction 133.4 tonnes →€283.3 / tonne CO_2

3.1.15 Measure 11.2: Eco-driving for Municipal Employees

Eco-driving is a fuel-efficient, adaptive and safe way of driving. Training in eco-driving teaches drivers to utilise vehicles differently and bring out new potentials by adaptive driving including foreseeing traffic situations and economic ways of using gears and brakes. Drivers that receive eco-driving training reduce their fuel consumption.

This measure concerns training municipal employees in eco-driving. Training only small numbers of employees in a large municipality like Malmö will lead to changes only on the part of those employees that have taken the training. By increasing the number of employees that receive eco-driving training from the tens or hundreds to at least one thousand by the end of SMILE it was envisaged that a threshold would be reached whereby interest in eco-driving would begin to diffuse within the entire population of municipal employees and then beyond to the general populace in the city of Malmö.

Key Results

Summary of key evaluation results:

- At an individual level a short term reduction in fuel consumption, and hence CO_2 emissions, of 10% (i.e. 0.21 MJ/vkm) can be assumed, but tailing off as time passes if no reinforcing measures or training are put in place.
- Due to a relatively low take-up within the municipality, this measure reduced fuel consumption across the whole municipal fleet (and resulting CO_2 emissions) by 0.01 MJ/vkm (0.47%) on average - a very marginal improvement.
- This measure has not been as successful as had been hoped for because of difficulties to get municipal employees to participate in the training. It is suspected that the principle reason for this difficulty is not that employees do not want to take eco-driving but is rather a management issue and that middle-level managers find it difficult to find time for staff to participate.
- For this measure to be successful in the long-term, once the participation issue raised above is addressed, it is imperative that the municipality finds was to give repeater training and the resources/possibility for staff to take such training.

Recommendations

- Recommendation 1 – Studies in Sweden show that the positive effects of eco-driving wear off during the weeks and months that follow the completion of the training exercise. To maintain the environmental benefits it is necessary that the initial eco-driving training is reinforced by one or more of the following, which can even be implemented in a combined way: Periodic refresher sessions or other “reminder” programmes or a proper fuel management programme including:
  - Monitoring at the level of individual drivers
  - Performance feedback
  - Incentives
  - Refresher training
- Recommendation 2 – It is recommended that to achieve wider benefits of this measure the eco-driving is encouraged and promoted for personal use. Indeed, the original project description for 11.2 suggested that this would be an indirect benefit of this measure.
- Recommendation 3 – It is recommended to co-ordinate eco-driving efforts with other large organisations in Malmö to show to participants that eco-driving is part of a city-wide initiative.

Transferability

This measure has a potential for transferability where municipal authorities are willing and able to offer eco driving training programme and motivate and encourage staff to train in eco driving techniques and refresher sessions and programmes.

Components relevant to transferability of measure 11.2	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Services Offered				
	Training in eco driving	High	1	Eco-driving is a fuel-efficient, adaptive and safe way of driving. Training in eco-driving teaches car drivers to utilise vehicles differently and bring out new potentials by adaptive driving including foreseeing traffic situations and economic ways of using gears and brakes. Drivers that receive eco-driving training reduce their fuel consumption by learning a more efficient, adaptive and safe way of driving. It is also worth noting that studies apparently show that the positive effects of eco-driving wear off during the week and months that follow the completion of the training exercise. To maintain the environmental benefits it is necessary that the initial eco driving training is complemented by periodic refresher sessions. This service is transferable where there is support for and availability of training and resources for eco driving training programme and refresher sessions and where opportunities exist to practice eco driving.
Target Population				
	Employees of the City of Malmö	High	0	This measure concerns training municipal employees in eco-driving. Training only small numbers of employees in a large municipality like Malmö will lead to changes only on the part of those employees that have taken the training. By increasing the number of employees that have or will have had eco-driving training it is envisioned that a threshold will be reached whereby interest in eco driving will begin to diffuse within the entire population of municipal employees and then beyond to the general population in the city of Malmö. Transferability potential exists where there is willingness amongst municipal authorities to encourage their employees to participate in such projects and where employees themselves recognise the benefits of eco driving and are willing to take up eco driving training.
Geographical Area Covered				
	Malmö city	High	1	This measure has been implemented in the City of Malmö. This characteristic is transferable to any city and authority able and willing to

Components relevant to transferability of measure 11.2	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				promote and offer eco driving training and where there are resources available to introduce such programme.
Finances				
	Operating costs	High	0	Operating costs are the costs for subcontracts to the private driver education schools and salary of measure leader. This characteristic is transferable where resources are available as there will be costs associated with establishing and running of similar eco driving training programmes. Also, willingness of municipal authorities to participate is an important aspect of the success of such programmes.
Stakeholders' Involvement				
	Miljöförvaltningen (Environment Department), City of Malmö	High	1	Miljöförvaltningen (Environment Department), City of Malmö has a leading role, setting up training schedule and contracting traffic school. Transferability exists where authorities have resources and are willing to promote similar programmes to achieve environmental benefits.
	Gatukontoret (Roads and Parks Department), City of Malmö	High	1	Gatukontoret (Roads and Parks Department), City of Malmö, is a principal participant, designing communication strategy and information material. This characteristic is transferable where similar authorities are willing to promote such programmes and their wider application. Attractive information material can be a very good marketing tool to help projects like this to develop and expand, attract interests of organisations and promote their wider benefits.
Legal or contractual requirements				
	Contracts	High	1	Contracts would have set up between the city of Malmo and the subcontractor to provide the necessary technical expertise to set up the internet food logistics system. Transferability exists where such contractual arrangements need to be in place for successful introduction and running of the project.

Components relevant to transferability of measure 11.2	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Awareness and Communication				
	Awareness and acceptance	High	0	Awareness and acceptance of the measure on the part of the general public are the two indicators used and reported for this measure. Awareness and acceptance on the part of municipal employees might have been an alternative indicator but this has not been possible. The general public survey undertaken as part of SMILE during April and May 2008 polled members of the general public in various public spaces. The results of the survey suggest that perhaps as many as 2% of the general public are aware that Malmö is offering eco driving training to many of the municipal employees in Malmö. Transferability exists where there are opportunities for marketing and promotion of such programmes to a wider population to increase their levels of awareness and acceptance and where the survey process can measure the increase in awareness and acceptance and therefore success of the measure.
Wider Issues				
	Culture / lifestyle	Low	0	This measure concerns changing driver behaviour and thus the environmental performance of the municipal car fleet. This results in reduced fuel consumption and reduced emissions. It is recommended that to achieve wider benefits of this measure the eco driving is encouraged and promoted for personal use where the opportunities exist, i.e. people owning cars which are technologically equipped to allow for eco-driving and maintaining and enhancing the associated environmental benefits. Potential for transferability exists where awareness of eco driving wider benefits is present and people have the opportunity to train in and use eco driving to achieve its wider benefits.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration:		3 years			
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	7,180	1,890	0	-9,070	-9,070
Year 2	276,970	28,610	0	-305,580	-314,650
Year 3	1,196,140	231,920	0	-1,428,060	-1,742,710
Year 4	1,100,000	130,000	0	-1,230,000	-2,972,710
Total	2580290	392420	0	-2,972,710	
NPV	2302928	351000	0	-2653928	
Average net present annual cost				-884643	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	230983	35129	0	-266112
NPV	206154	31421	0	-237575
Average net present annual cost				-79192

The emissions as a result of this measure we estimated as follows:

The absolute reduction in CO_2 emissions as a result of this measure was estimated as 9.36 tonnes, due in part to the lack of ongoing reinforcement of the ecodriving training through either an incentive programme or refresher training. Comparison with the total measure cost gives a cost effectiveness value of 283539 SEK/tonne CO_2 or €25382/tonne CO_2.

Corresponding figures for other pollutants included in the evaluation are:

NOx 1116.5 SEK/g or €99.9/g

PM10 10449 SEK/g or €935/g

3.1.16 Measure 11.8: Eco-driving for Hospital Employees

The University Hospital, Malmö General Hospital (UMAS) is one of the hospitals owned and operated by the regional health authority which is part of the regional authority called Region Skåne.

In 2002, UMAS conducted a pilot study about eco-driving. In total about 40 people took part in the training and as a result of this eco-driving training fuel consumption decreased by 7-10% in the period directly after the training sessions. While the results of this training were encouraging, it is well-known that such training must be repeated for the driver's habits to change during the longer-term.

Since 2002 the effect of the pilot study has decreased to the point that by 2006 it can be questioned whether there was any measurable effect retained by the drivers. Furthermore, some of the 40 people from the study in 2002 no longer work at UMAS or have perhaps changed jobs where they drive, while at work, less frequently. This suggested that the pilot study would have to be repeated in some way.

In this measure, all staff members who drive more than 5,000 km a year on business, i.e. as part of their work at UMAS, were informed about and offered a course in economical driving, traffic safety and driver ergonomics. The goal was that an estimated 5% of the staff at UMAS should receive training in eco-driving during a three-year period.

Key Results

Summary of key evaluation results:

- This measure failed to train as many staff as had been originally intended. Approximately 100 employees received training compared with the original goal of 300.
- This measure may have led to the reduction of fuel consumption of up to 1950 litres petrol (or equivalent) and a reduction in emissions of 4290 kg of CO_2, 89.7g of NOx and 8.97g of PM_{10} on a yearly basis. This result cannot be maintained without procedures to ensure that the positive effects of eco-driving are maintained in future years. These effects can be maintained by refresher courses or other methods.
- At an individual level indications from overall fuel records suggest an reduction of between 4.5% and 7% in fuel consumption, with the lower figure being for regular drivers, suggesting that regular drivers already drove more efficiently than those who drive infrequently for business purposes.

Recommendations

- Recommendation 1 – Encourage participation through course design and integration with other human resource development initiatives. It is important to reduce the barrier for staff to participate because of lack of time to devote to training which arises from middle-level managers seeing eco-driving as an extra, un-related to the core work tasks for their staff. If it would be possible to "bundle" eco-driving with other continuing education or work-related training then it might be easier to increase participation. For example, eco-driving combined with fire-safety training is a possible bundle.
- Recommendation 2 – More publicity on the part of UMAS in internal newsletters etc. about the experiences and benefits of eco-driving.
- Recommendation 3 – It is recommended that to achieve wider benefits of this measure the eco-driving is encouraged and promoted for personal use where the opportunities exists, i.e. people owning cars which are technologically equipped to allow for eco-driving and maintaining and enhancing the associated environmental benefits.
- Recommendation 4 – It is recommended to co-ordinate eco-driving efforts with other large organisations in Malmö to show to participants that eco-driving is part of a city-wide initiative.
- Recommendation 5 – To achieve a wider application of this measure driving tests centres could offer eco-driving techniques. Driver education schools, because of a national policy decision, have begun to integrate "eco-driving" concepts and methodology into the regular curriculum.

- Recommendation 6 – it might be considered to install vehicle computers in order to create the most efficient feedback system on fuel consumption, as per measure 10.1, Freight driver support.

Transferability

This measure has a potential for transferability where hospital senior staff are willing and able to offer eco driving training programme and motivate and encourage staff to train in eco driving techniques and refresher sessions and programmes. This measure only applied to staff who drive 5000km a year and it may be worth considering provision of training courses to all employees to increase the environmental benefits and safety, subject to funding requirements.

Components relevant to transferability of measure 11.8	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Services Offered				
	Training in eco driving	High	1	Eco-driving is a fuel-efficient, adaptive and safe way of driving. Drivers who receive eco-driving training reduce their fuel consumption by learning a more efficient, adaptive and safe way of driving. Hospital staff were informed about and offered a training course in economical driving, traffic safety and driver economics. This service is transferable where there is support for and availability of training and resources for eco driving training programme and refresher sessions and where opportunities exist to practice eco driving.
Target Population				
	Hospital employees who drive more than 5000km per year	High	0	All members of staff who drive more than 5.000 km a year on business were offered training. It is anticipated this will lead to reduced fuel consumption both when driving on duty and as a private person. Transferability potential exists where there is willingness amongst the senior staff to encourage their employees to participate in such projects and where employees themselves recognise the benefits of eco driving and are willing to take up eco driving training. It may be worth considering provision of training courses to all employees to increase the environmental benefits and safety, subject to funding requirements.
Geographical Area Covered				
	The city of Malmo and the Skåne region	High	1	This measure has been implemented in the City of Malmo with benefits expected in a wider region of Skane. This characteristic is transferable to any city and authority able and willing to promote and offer eco driving training and where there are resources available to introduce such programme.
Finances				
	Operating costs	High	0	Operating costs are the costs for subcontracts to provide eco driving training. This characteristic is transferable where resources are available as there will be

Components relevant to transferability of measure 11.8	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				costs associated with establishing and running of similar eco driving training programmes. It may worth for cities which plan such a scheme seeking funding similar to SMILE project.
Stakeholders' Involvement				
	The driving instruction school Local and regional administration	High	1	The driving instruction school held the courses for UMAS as part of a procurement arrangement initiated centrally on the part of Region Skåne. Local and regional administration had a leading role in this measure. Transferability exists where authorities have resources and are willing to promote similar programmes to achieve environmental benefits. Also, training schools need to be able provide the necessary eco driving training to prospective authorities and their employees.
Legal or contractual requirements				
	Contracts	High	1	Contracts would have been set up between the regional authority and its subcontractors to provide the eco driving training programme. Transferability exists where such contractual arrangements need to be in place for successful running of the project.
Awareness and Communication				
	Awareness and acceptance	High	0	The take-up of this measure on the part of hospital staff and their most immediate supervisors appears to be relatively limited and somewhat below the expectations that were part of the original intentions of this measure. Staff awareness of the measure per se has been gauged as being rather high, at least based on the contacts that the evaluator has had with UMAS. Transferability exists where participants of similar training programmes recognise the importance and benefits of eco driving and are willing and have the necessary resources to apply eco driving techniques and promote the concept to their

Components relevant to transferability of measure 11.8	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				colleagues. For transferability to succeed it is also necessary for drivers to have sufficient experience of eco driving to make relevant contribution to its environmental benefits.
Wider Issues				
	Culture / lifestyle	Low	0	This measure concerns changing driver behaviour and thus the environmental performance of the municipal car fleet. This results in reduced fuel consumption and reduced emissions. It is recommended that to achieve wider benefits of this measure the eco driving is encouraged and promoted for personal use where the opportunities exist, i.e. people owning cars which are technologically equipped to allow for eco-driving and maintaining and enhancing the associated environmental benefits. Potential for transferability exists where awareness of eco driving wider benefits is present and people have the opportunity to train in and use eco driving to achieve its wider benefits.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 3 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	14,200	0	0	-14,200	-14,200
Year 2	10,700	0	0	-10,700	-24,900
Year 3	2,700	208,000	0	-210,700	-235,600
Total	27600	208000	0	-235,600	
NPV	26144	187604	0	-213748	
Average net present annual cost				-71249	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	2471	18620	0	-21091
NPV	2340	16794	0	-19134
Average net present annual cost				-6378

The annual reduction in CO_2 emissions as a result of this measure was estimated as 4.29 tonnes. Comparison with the annualised measure cost gives a cost effectiveness value of 16608 SEK/tonne CO_2 or €1487/tonne CO_2.

Corresponding figures for other pollutants included in the evaluation are:

NOx 794 SEK/g or €71.1/g

PM10 7943 SEK/g or €711/g

3.1.17 Measure 11.9: Heavy Eco-driving

Malmö LBC is a major player in the Malmö goods transport market, operating 150 vehicles a day in the city of Malmö, as well as on long distance. It has access to 250 heavy goods vehicles and 300 drivers, organized under 180 independent vehicle-owner companies.

The business is divided into three main business areas: long-distance distribution, express delivery services, and crane and construction services. The type of goods is full-load, mainly construction material, food and drink products, and pharmaceuticals.

Malmö LBC has the ambition to lower the environmental impact of their business, such as fuel consumption and related emissions, as well as reducing the number of unloaded kilometres. For this reason, Malmö LBC has created and implemented a training programme that provides the drivers with skills and competences on how to drive in a more fuel efficient and environmentally friendly manner.

Key Results

Summary of key evaluation results:

- The measure has led to reduced fossil fuel consumption and an annual reduction of the emissions of the greenhouse gas CO_2 by 633,592 kg.
- Immediately after the eco-driving classes an average decrease of fuel consumption of 16 percent was achieved. Malmö LBC has not measured the long-term effect of the eco-driving education on an individual basis, but economic incentives have been used and a reduction of 9 percent in overall fuel use has been observed.
- The very ambitious (and unrealistic) numerical target was not achieved, but this should not mean that the measure is considered as unsuccessful as the measure has been economically efficient from both a business and societal perspective.

Recommendations

- Recommendation 1 – Continue the Heavy Eco-Driving education so that it will include all drivers.
- Recommendation 2 – Implement an efficient and continuous feedback system, and use economic incentives, such as bonuses and gifts. People’s travel behaviour is influenced by incentives, personal and economic. To achieve and maintain the heavy eco driving it may be necessary to keep offering such incentives to the drivers which may go against the measure objectives. It is recommended to establish whether reasons why people joined the training programme meet the objectives of the scheme. This will help create an understanding of the measure effectiveness and enable future planning of the scheme in ways to ensure its success.
- Recommendation 3 – Install vehicle computers in order to create the most efficient feedback system (measure 10.1, Freight driver support).
- Recommendation 4 – While waiting for the installation and subsequent use of the vehicle computers to establish a feedback system that encourages drivers to continue with driving habits picked-up from eco-driving training, ensure that refresher courses on Heavy Eco-driving are offered to drivers and vehicle-owners to move driver performance closer to the « immediate effect of eco-driving » reduction in fuel use by 16%.

Transferability

This measure has a potential for transferability where driving schools are willing and able to offer eco driving training programme and where there are participants who are willing and encouraged to train in eco driving techniques and who show awareness of the eco driving wider environmental, economic and social benefits.

Components relevant to transferability of measure 11.9	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Services Offered				
	Eco driving training programme for HGV drivers	High	1	A company designed training programme was developed, which combined training in Heavy Eco-Driving, with education on road safety issues, as well as health and safety (H&S). This combination of various subjects was supposed to make the training more attractive to the carrier owners and the drivers. This service is transferable where there is support for and availability of such programmes and where opportunities exist to practice eco driving.
Target Population				
	Haulage contractors and their drivers connected to Malmö Lorry Centre	High	0	Malmö LBC has the ambition to lower the environmental impacts of their business, such as fuel consumption and related emissions. For this reason, Malmö LBC has created and implemented a training programme that provides the drivers with skills and competences on how to drive in a more fuel efficient and environmentally friendly manner. Transferability potential exists where there is willingness amongst businesses to participate in such projects and where businesses recognise their wider benefits.
Geographical Area Covered				
	Malmö city and where Malmö Lorry Centre has activity	High	1	Malmö LBC is a major player in the Malmö transport market, operating 150 vehicles on a daily basis in the city of Malmö as well as on long distance routes. This characteristic is transferable to any city or wider area willing and able to offer eco driving training programmes in a similar context and where there are resources available to introduce such programmes.
Finances				
	Operating costs	High	0	Operating costs are the costs of education, development and implementation. The drivers' wages (hourly cost) are not included as they were financed by the vehicle owners. This characteristic is transferable where resources are available as there will be costs associated with establishing and running of similar programmes. Also, willingness of business to participate is an important aspect of the success of such

Components relevant to transferability of measure 11.9	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				programmes.
Human Resources				
	STR Services AB (organization of Swedish traffic schools): Suppliers of the company tailored Heavy Eco-Driving education	High	1	STR Services AB developed a tailor-made Heavy Eco-Driving education for Malmö LBC, which combined heavy eco-driving with education in the field of road safety, and health and safety. The training programme consists of a theoretical part and practical training in vehicle, accompanied by an instructor. This characteristic is transferable provided there are driving schools which are willing and able to provide eco driving training programmes.
Stakeholders' Involvement				
	Customers	Medium	0	Some customers have the requirement that their transport suppliers should have an eco-driving education. Eco-driving transport companies can be important for the customers' sustainability approach, and an important account in the Sustainability Report. This characteristic is transferable where customers have similar expectations from and requirements for their transport suppliers.
	The National Road Administration (Vägverket)	High	1	This authority may use the Malmö LBC as a "good example" to inspire and promote the eco-driving to other stakeholders as well as internationally. This characteristic is transferable where similar authorities are willing to promote such programmes and their wider application.
	City of Malmö	High	1	Malmö LBC contributes to the reduction targets of CO2 of the city of Malmö. Transferability exists where authorities are willing to promote any concepts of sustainable transportation and promote their application to achieve environmental benefits.
Legal or contractual requirements				
	Contracts	High	1	A contract would have been set up between Malmo LBC and its subcontractor to

Components relevant to transferability of measure 11.9	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				provide the heavy eco driving training programme. Transferability exists where such contractual arrangements need to be in place for successful running of the project.
Awareness and Communication				
	Awareness and acceptance	High	0	Both the acceptance level and awareness level of the measure have increased during the course of implementation, according to the Manager in charge at Malmö LBC. The vehicle owners who have received the Heavy Eco-Driving education have become aware of potential to save fuel, and hence reduce costs, a fact that has motivated them to apply the skills in their own driving, as well as to send their drivers to undergo the same training. Transferability exists where participants of similar training programmes recognise the importance and benefits of eco driving and are willing to apply eco driving techniques and promote the concept to their colleagues. For transferability to succeed it is also necessary for drivers to have sufficient experience of eco driving to make relevant contribution to its environmental benefits.
Wider Issues				
	Culture / lifestyle	Low	0	A positive effect of the eco-driving education is also the drivers' motivation and general awareness. This has, for example, resulted in significantly reduced levels of damaged goods and vehicle accidents (approximately 20 percent). This increased awareness can be assumed to have positive external effect on society in general, in terms of increased level of road safety. Potential for transferability exists where awareness of eco driving wider benefits is present and people have the opportunity to train in and use eco driving to achieve its wider benefits.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 4 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	15,130	0	0	-15,130	-15,130
Year 2	0	500,245	600,000	99,755	84,625
Year 3	0	581,196	3,000,000	2,418,804	2,503,429
Year 4	0	320,000	3,600,000	3,280,000	5,783,429
Total	15130	1401441	7200000	5,783,429	
NPV	14618	1270051	6403127	5118459	
Average net present annual cost				1279614	

Adjusted to Euros, allowing for purchasing parity conversions					
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	
Total	1354	125455	644532	517723	
NPV	1309	113693	573197	458196	
Average net present annual cost				114549	

The annual reduction in CO_2 emissions as a result of this measure was estimated as 633,592 tonnes due to the inclusion of an inbuilt incentive for the owner-drivers who participated. Comparison with the annualised measure cost gives a cost effectiveness value of -2.02 SEK/tonne CO_2 or -€0.18/tonne CO_2. Just as for measures 5.2 and 5.3, this measure brings a reduction in cost together with the reduction in pollution. The high distance travelled and relatively high fuel consumption of heavy goods vehicles contribute to this result.

3.1.18 Measure 12.1: Use of Real Time Applications for Traveller Services

In this measure about 50 real time signs at bus stops and 11 monitors in shopping centres and other strategic positions have been installed. Existing signs showing planned time to show real time information have also been upgraded.

Key Results

Summary of key evaluation results:

- Real time signs on bus stops have an impact on the perception of quality for public transport in many ways. It makes travelling without timetables possible and this is dependant on the number of signs installed. When the number of bus stops with signs increased from 44 to 84, the percentage of travellers that considered real time signs a substitute for the time table showed a significant increase, from 71% to 74%.

- When asked to agree with different statements about real time signs before and after the final installation of signs, the percentage that agreed completely or partly changed for the following statements: “real time signs are hard to understand “ (from 20 to 16%) and “ the buses in Malmö keeps the time table”(from 79 to 75%). This shows that real time signs are easy to understand and showing the right kind of information to the travellers. The accuracy of the buses has nothing to do with the signs but maybe they help to point out the delays.
- Real time signs increase the number of journeys. With 44 signs installed, 25 % said that they travelled more and with 84 signs this number was 27%. The objective of 500,000 (1.7%) more journeys with the buses in Malmö as a result of the real times signs was achieved. In fact, the total increase was 5% but not as a result of this measure alone. Though, it is difficult to state the proportion due to the real times signs, the willingness to pay can offer some guidance. The willingness to pay for real time signs was roughly half of the willingness to pay for cameras. The willingness to pay for mobile internet was lower.
- The “willingness to pay” for real time signs on the bus stops are high when estimated in a Stated Preference study. The 90%-confidence interval shows a positive value for signs at the bus stops for fare price as well as travel time. The best estimate shows a value of 4% of the price for a monthly ticket and 4% of the travel time for this measure with signs at 84 bus stops compared to no signs at all.

Recommendations

- Recommendation 1 – The measure has demonstrated a direct passenger benefit both from the attitudinal survey and in terms of results from the stated preference study. There has been an overall increase in bus use in Malmo and this measure has undoubtedly contributed to that increase. On this basis we would recommend the installation of real time bus information systems to other cities as part of a package of bus service improvements.
- Recommendation 2 – Incorporate the installation of the real time information system with a wider transport information strategy.
- Recommendation 3 – Understand the project objectives and how they will be delivered by what is implemented.
- Recommendation 4 – Incorporate a sound evaluation methodology that will enable you to establish if the objectives have been met.
- Recommendation 5 – Ensure that the tender includes adequate technical back-up to ensure long term operation of the system.

Transferability

A strong potential exists for transferability of this measure. We are increasingly becoming an information based society and our expectations for information availability are constantly increasing and sometimes taken for granted. Where information technology can benefit the society and aid process of modal switch and increase in perception and usage of public transport with its associated benefits its use and availability needs to be encouraged.

Components relevant to transferability of measure 12.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Traffic information strategy	High	1	Development of the Traffic information strategy is an ongoing task for this measure. It consists of printed traffic information, dynamic traffic information on board trains and buses and at train and bus stops, web based traffic information, web and SMS services in mobile phones, IVR (Interactive Voice Response) service in telephone for travel information, all of which confirms commitment to traveller information within the regional transport strategy. The strategy has got a potential for transferability considering rapid moves towards information based societies albeit with a probable need to adapt to suit characteristics of provision of bus travel information specific to a city. To encourage uptake of similar measures in other cities Traffic Information Strategy could form part of the local and national transport policy.
Services Offered				
	Real Time Information for bus travellers	High	0	A complete real time system like this gives unique possibilities for the travellers to get updated information at bus stops, internet and through the mobile phone and gives better service and possibilities to plan a journey with different bus lines. Previously no such complete system, with both real time information and traffic messages, existed in Sweden. This characteristic is transferable to cities where such information technologies exist and where the authorities and transport service providers have the ability and capacity to provide such service.
Target Population				
	City of Malmo commuters	High	1	These are customers, especially commuters, using city buses and regional buses on frequently used bus stops. Potential customers can be the car owners taking their car for the transport between home and work. This characteristic has a strong potential for transferability where there is adequate provision of bus network and its supporting RTI infrastructure as the commuters can benefit from a better bus service and opportunities to plan their journeys. People’s travel behaviour and need for travel also need to be taken into

Components relevant to transferability of measure 12.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				consideration to determine the success of this measure in a particular city. With regards to car owners, achieving modal shift and its associated benefits is supported in many urban areas and therefore this characteristic has a potential for transferability. However, issues such as level, efficiency and convenience of bus services, people's travel behaviour and need for travel also need to be taken into consideration to determine the likely levels of modal shift.
Geographical Area Covered				
	Frequently used bus stops and strategic positions near bus stops in the city of Malmö	High	1	In this measure 61 signs and different monitors have been installed. 50 bus stops now display real time departure times. 10 monitors have been erected in shopping centres and at other strategic positions in order to facilitate public transport use in places with high customer density. In addition a large information sign has been installed at the main bus terminal to provide all passengers with a better overview of services and their real time departures. Existing signs previously showing planned time have also been upgraded to show real time information. This applies to 34 monitors and 34 LED-signs. Transferability can be achieved where there is adequate provision of bus network and its supporting infrastructure, where such information technologies exist and where the authorities and transport service providers have the willingness and capacity to provide such service.
Finances				
	Operating costs	High	2	Operating costs are the costs for 50 concrete foundation plus pole including electricity installations, 50 realtime signs, 10 monitors, 1 large sign and personnel and subcontracting. This characteristic is transferable as there will be costs associated with establishing and running of such scheme. It may worth for cities which plan such scheme seeking funding similar to SMILE project.
	Revenues	High	0	This measure is expected to generate 0,5m new journeys with an unchanged traffic volume.

Components relevant to transferability of measure 12.1	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				A Stated Preference study estimated a high "willingness to pay" for real time signs at the bus stops. The 90%-confidence interval shows a positive value for signs at the bus stops for fare price as well as travel time. This characteristic comprises measure objectives and evaluation methodology to gauge the success of the measure objective. Transferability exists where the objectives are tangible, achievable and measurable and where there is a sound evaluation methodology which will enable to establish if the objectives have been met.
Stakeholders' Involvement				
	Skånetrafiken City of Malmo Environmental and Traffic/street departments. Contracted equipment suppliers	High	0	Skånetrafiken, the regional transport authority, has taken the lead as part of its strategic role in determining the specifications for public transport. Contracted equipment suppliers were selected through open tender procedures. Transferability can be achieved where there is a coordinated approach to providing similar services. The authorities can offer their support and influence their decision for uptake of such measures.
Legal or contractual requirements				
	Contracts	High	1	Contracts would have set up between Skånetrafiken and their subcontractor to provide the necessary equipment and support services. Transferability exists where such contractual arrangements need to be in place for successful running of the project.
Awareness and Communication				
	Awareness and	High	0	The evaluation shows an increase in awareness and acceptance as well as an

Components relevant to transferability of measure 12.1	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
	acceptance			increase of perception of quality for public transport. Also, real time signs have increased the number of journeys. Transferability needs to be encouraged where similar measures can increase the number of bus journeys as this has wider benefits. Also, appropriate survey process and evaluation methodology needs to be developed and used to determine the increase in levels of awareness and acceptance.
Wider Issues				
	Culture / lifestyle	Medium	1	Information technology has become an integral part of our lives and information is now readily available by the use of various communication channels. This measure can help plan public transport journeys, increase the number of journeys and increase perceptions of quality of public transport. This measure has a strong potential for transferability considering advancements in information technology, software availability and the move toward information based societies. Transferability can also be encouraged where measures have benefits for a wider population using public transport.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 4 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	8,645	1,110,826	0	-1,119,471	-1,119,471
Year 2	0	2,608,121	0	-2,608,121	-3,727,592
Year 3	0	3,242,247	0	-3,242,247	-6,969,839
Year 4	0	3,282,203	0	-3,282,203	-10,252,042
Total	8645	10243397	0	-10,252,042	
NPV	8353	9292542	0	-9300895	
Average net present annual cost				-2325224	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	774	916972	0	-917745
NPV	748	831853	0	-832600
Average net present annual cost				-208150

The indicators chosen and monitored for measure 12.1 (focusing on awareness, service and patronage quality) have not been converted into emissions and so are not included in this cost effectiveness evaluation.

3.1.19 Measure 12.2: Traffic Monitoring

This measure involved installation of an adaptive traffic signal control system at 10 traffic signals in Malmö. The aim was to use the adaptive system to control traffic flow leading to shorter travel times, reduce emissions and give priority to public transports, cyclists and pedestrians.

Key Results

Summary of key evaluation results:

- The comparison between the before and after situations does not display significant changes in the evaluated effects: time, speed, fuel consumption and exhaust emissions.
- If anything, the limited individual significant comparison displays a negative impact from introducing the adaptive traffic signal control system.

Recommendations

- Recommendation 1 – to measure the success of adaptive traffic signal control and evaluate its results the system needs to be in place and running for some months; after surveys need to be repeated again to gain better and more reliable data and results of this system
- Recommendation 2 – it is recommended to seek information from similar projects in Europe to learn from their experiences and apply their knowledge in Malmo
- Recommendation 3 – it is recommended to establish the reasons why this measure has not reduced travel times rather than guess the possibilities in order to mitigate the problems and engage in a process of finding the most appropriate solutions to make this system achieve its potential bring the wider benefits

Transferability

Adaptive traffic signal control system has been developed in approximately 20 European cities. It is recommended to seek information from similar projects in Europe to learn from their experiences and apply their knowledge in Malmo.

This is in effect a reverse of the normal transferability process for CIVITAS measures.

Components relevant to transferability of measure 12.2	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Services Offered				
	Installation of adaptive traffic signal control system	High	0	Installation of an adaptive traffic signal control system in 10 traffic signals in Malmö to control traffic flow, lower emissions and give priority to public transports, cyclists and pedestrians. The comparison between the before and after situations does not display significant changes in the evaluated effects: time, speed, fuel consumption and exhaust emissions. This system can be used where the authorities support such measures and where the organisations exist which have the necessary technology to introduce and run such systems. According to the measure template this systems has been developed in approximately 20 European cities.
Target Population				
	The people who live in Malmö and who use the traffic system in Dalaplan area	High	2	People who use public transport and private cars in Dalaplan in Malmo. This characteristic applies to everyone using road transport which flows are controlled and managed by adaptive traffic signal control system.
Geographical Area Covered				
	Central Malmö	High	1	The area is a central part of Malmö where there is a hospital and big department store and some residential areas. This characteristic is transferable to any city willing to introduce adaptive traffic signal control system and where there are resources available to introduce such systems.
Finances				
	Operating costs	High	2	Operating costs are the costs for the personnel and subcontracting. This characteristic is transferable as there will be costs associated with establishing and running of such scheme. It may worth for cities which plan such scheme seeking funding similar to SMILE project.
Stakeholders’				

Components relevant to transferability of measure 12.2	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Involvement				
	Transport and traffic department of Malmö Stad Gatukontoret City of Malmö Street and Parks Department Public transport users Car drivers	High	0	About 90.000 people use public transport in Malmo every day and some travel in Dalaplan and every day about 25.000 vehicles travel in Dalaplan in Malmo. This characteristic is transferable where the co-ordination between all relevant stakeholders exists for successful implementation and running of such systems.
Legal or contractual requirements				
	Contracts	High	1	Contracts would have set up between the municipality of Malmo and their subcontractors to provide the necessary technology and support services. Transferability exists where such contractual arrangements need to be in place for successful running of the project.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 14 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	1100000	0	0	-1100000	-1100000
Year 2	1857000	0	0	-1857000	-2957000
Year 3	1889000	0	0	-1889000	-4846000
Year 4	2300000	0	0	-2300000	-7146000
Year 5	0	50000	0	-50000	-7196000
Year 6	0	50000	0	-50000	-7246000
Year 7	0	50000	0	-50000	-7296000
Year 8	0	60000	0	-60000	-7356000
Year 9	0	60000	0	-60000	-7416000
Year 10	0	80000	0	-80000	-7496000
Year 11	0	80000	0	-80000	-7576000
Year 12	0	80000	0	-80000	-7656000
Year 13	0	80000	0	-80000	-7736000
Year 14	0	80000	0	-80000	-7816000
Total	7146000	670000	0	-7816000	
NPV	6504418	476688	0	-6981107	
Average net present annual cost				-498650	

Adjusted to Euros, allowing for purchasing parity conversions					
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	
Total	639698	59977	0	-699675	
NPV	582264	42672	0	-624937	
Average net present annual cost				-44638	

The adaptive traffic signal control system was not functioning as expected at the time of the evaluation measurements, so that there is no suitable impact data to consider as part of the cost effectiveness analysis.

3.1.20 Measure 12.3: Mobile Internet Services in Connection to Bus Information

This measure involved the installation of a mobile internet service based on already existing:

- real time system with AVL-based buses,

- customer database and
- internet-based travel planner.

With the objective of increasing the number of bus journeys by 0.5 million

Key Results

Summary of key evaluation results:

- The awareness of the mobile service are a lot higher than the experience of it. That reflects the fact that this measure depends on access to a mobile phone and the knowledge to install and use this service. This is a lot more common among the younger passengers (under 30) than the older. The group who have experience of the service and are registered on "My Pages" and have used WAP on mobile phones are at present close to 20% of the passengers.
- The lack of experience of the service reflects the ability to rate different aspects of it. The number of respondents answering "I don't know" varies between 30 and 60%.
- Mobile internet services increase the number of journeys, 8 % said that they travelled more.
- Mobile services mean a higher travel quality for 21% of the passengers.
- The 'willingness to pay' for mobile services has been difficult to estimate in a Stated Preference study. The best estimate shows a value of 13% (3 minutes) of the travel time for mobile services with a 90% confidence interval that includes zero. The designer of the study states that few of the participants took any notice of the factor 'mobile services'.
- The acceptance of this technology and the experience of it will probably increase in the future as the society as a whole gets more and more reliant on the internet as an information source. It will probably be the youngest passengers that lead this development.

Recommendations

- Recommendation 1 – It is recommended to develop a marketing strategy and identify the key user groups and messages that will lead to the optimum marketing aimed at a further increase in the level of awareness and the number of journeys.
- Recommendation 2 – To ensure that Traffic Information Strategy forms part of the local and national transport policy to encourage uptake of similar measures in other cities and towns and to ensure compatibility between regions.

Transferability

A strong potential exists for transferability of this measure which is summarised in Wider issues characteristic. We are increasingly becoming an information based society and our expectations for information availability are constantly increasing and sometimes taken for granted. Where information technology can benefit the society and aid process of modal switch its use and availability needs to be encouraged.

Components relevant to transferability of measure 12.3	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Traffic information strategy	High	1	Traffic Information Strategy is an ongoing task for this measure. The strategy has got a potential for transferability considering rapid moves towards information based societies albeit with a probable need to adapt to suit characteristics of provision of bus travel information specific to a city. In addition to mobile media the strategy needs to take account of the characteristics and level of provision of bus services specific to a particular city. To encourage uptake of similar measures in other cities Traffic Information Strategy could form part of the local and national transport policy.
Services Offered				
	Dissemination of real time bus travel information to internet enabled mobile phones	High	1	The aim is for real time system and customer management system to make best use of mobile media such as SMS, WAP, Java and 3G in order to provide customers with traffic and campaign information they request. This characteristic is transferable to cities where such information technologies exist and where the transport service provider has the ability and capacity to provide such service. Potential constraint exists in absence or poor levels of customer management systems, however this can be overcome by introducing such systems.
	Digital timetable on mobile phones	High	1	Digital timetables can be downloaded to a mobile phone for use off line. This solution has reduced the need for printed timetables for travellers using mobile phones. This characteristic is transferable to cities where such information technologies exist and where the transport service provider has the ability and capacity to provide such service.
Target Population				
	General population - users in the age of 18-40 years	High	1	The target group is strategic important and in high priority within Skånetrafiken, and have overall a high grade of technical maturity and experience of using Internet and advanced mobile phones. A common goal of this measure is to increase the number of bus journeys. To see a change in the number of passengers as a result of this specific is difficult. Often it is a cumulative effect of many measures which contributes to increase in public transport journeys. This

Components relevant to transferability of measure 12.3	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				characteristic has a potential for transferability provided users are familiar with the communication technologies required to use this service and there is adequate provision of bus network and its supporting infrastructure. People's travel behaviour and need for travel also need to be taken into consideration to determine the success of this measure in a particular city. Marketing campaigns can also be useful to increase the level of awareness and usage of bus services.
	Car users	High	0	With improved bus travel information more people are expected to choose public transport instead of private car as the up-to-date travel information is accurate and can also offer alternatives if problems arise. Achieving modal shift and its associated benefits is supported in many urban areas and therefore this characteristics has a potential for transferability. However, issues such as level, efficiency and convenience of bus services, people's travel behaviour and need for travel also need to be taken into consideration to determine the likely levels of modal shift.
Geographical Area Covered				
	Skanetrafiken Bus Routes in Malmo	High	1	This measure applies to provision of real time bus information for the bus routs operated by Skanetrafiken in Malmo. Transferability can be achieved where there is adequate provision of bus network and its supporting infrastructure, where such information technologies exist and where the transport service provider has the ability and capacity to provide such service.
Stakeholders' Involvement				
	Users in the age 18-40 years	High	0	This group is strategically important for Skanetrafiken and of high priority and have overall a high level of technical maturity and experience of using the internet and advanced mobile phones. Transferability potential exists with similar groups elsewhere and with correct marketing and consultation exercises.
	Skånetrafiken (Skåne regional transport authority),	High	0	Skånetrafiken has a leading role in measuring coordination, project leading and implementation. Transferability can be achieved where there is an organisation which as able and willing to introduce such measure.

Components relevant to transferability of measure 12.3	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
	Local and regional transport authorities	High	1	These authorities can offer strong support for such technologies and their application. Transferability exists where the authorities offer their support and influence their decision for uptake of such measures.
	Private consultants	High	0	Private consultants have responsibility for development of required applications and mobile services. Potential for transferability exists where there are companies which can offer required technology.
Technical requirements				
	Internet enabled mobile phones	High	2	Skenetrafiken is providing bus travel information via mobile phones. Transferability can be achieved where there are internet enabled mobile phones in use by potential users.
	Mobile phone media (SMS, WAP, Java, 3G)	High	2	Real time bus information is provided by the use of mobile phone media, SMS, WAP, Java, 3G. Transferability can be achieved where such technology is available.
Awareness and Communication				
	Increased awareness of good public transport	High	1	A survey of 3313 passengers on board buses was conducted to assess awareness and acceptance levels amongst passengers. Pre study was also conducted for comparative purposes. Transferability of such surveys can be achieved if they are conducted in similar context and have similar objectives.
Wider Issues				
	Culture / lifestyle	High	2	Information technology has become an integral part of our lives and information is now readily available by the use of various communication channels. This measure has a strong potential for transferability considering advancements in information technology, software availability and the move toward information based societies.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 5 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	5,938	19,399	0	-25,337	-25,337
Year 2	0	1,712,205	0	-1,712,205	-1,737,542
Year 3	0	4,889,461	0	-4,889,461	-6,627,003
Year 4	0	5,652,595	0	-5,652,595	-12,279,598
Year 5	0	622,260	0	-622,260	-12,901,858
Total	5938	12895920	0	-12,901,858	
NPV	5737	11476955	0	-11482692	
Average net present annual cost				-2296538	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	532	1154421	0	-1154952
NPV	514	1027397	0	-1027911
Average net present annual cost				-205582

The indicators chosen and monitored for measure 12.3 (focusing on awareness, service and patronage quality) have not been converted into emissions and so are not included in this cost effectiveness evaluation.

3.1.21 Measure 12.4: Internet Tool for Traffic Planning

Some people choose streets for cycling instead of cycling safely on bicycle lanes. In Malmö some bicycle lanes are located in or near low-traffic, green areas. As a result they are sometimes a bit difficult to find unless you know the area well.

www.trafiken.nu is a web site that provides information about traffic disruptions - such as accidents, roadwork, etc -- for cars and for public transportation. Strategically located cameras provide information in real time. There is a tool for journey planning. Skånetrafiken's trip planner on their website www.skanetrafiken.se functions in a way similar to the planner on www.trafiken.nu but obviously has a focus on trips by bus and train.

The purpose of this measure was to add the bicycle-net to the trip planners on the above websites thus connecting bicycles with public transportation.

Key Results

Summary of key evaluation results:

- At least 3% and as many as 18% of the general public may be aware of the measure but there is a lot of uncertainty about how reliable the result is. It is most likely that the figure is closer to the lower end of this range (i.e. 3%). This is based on the level of use of other trip planning functions in Malmö and the fact that there was no marketing. Had there been marketing the level of awareness would surely had been higher but is not possible to estimate.
- It has not been possible to assess acceptance levels. This is in part because of the nature of the measure, in part because of the measure not being in effect until late in the SMILE contract period.

Recommendations

- Recommendation 1 – There is considerable potential benefit from incorporating a market testing phase into the development of information tools such as this. There are various potential phases to this, including initial assessment of the expectations of potential users both from the perspective of ensuring user friendly design of the interface and also ensuring that the technical content is sufficient for the desired purpose. Once development has commenced there is significant extra value in conducting testing of the incomplete tool at a stage where the final functionality is clear, so that the initial research results can be checked. This would ensure that the technical development is on track and changes can be incorporated prior to final release, and also that the likely impact of the final tool can be more accurately estimated. It would be easy to arrange for this to be conducted in a way that the risk of damaging the future credibility of the measure could be minimised.
- Recommendation 2 – It is essential that measures like this one, which are essentially technical in nature but which require public use to be effective, are accompanied not only by the aforementioned research phases but also benefit from specific marketing of the services. The marketing would specifically benefit from the user research and the initial and intermediate stages. CIVITAS should require a strong marketing component of the funded technical measures that have a direct contact with customers or public transit users scheduled within the technical development plan.
- Recommendation 3 – The design of the measure should have included linkages to 11.1 (marketing of sustainable transport) and 8.3 (integration of cycling and public transport) in order to ensure proper relations between linked technical measures.
- Recommendation 4 – The design of the measure should have included specific meetings and promotional activities with the cyclist association “Cykelfrämjandet” or similar organisations and bicycle repair/sales shops as well as Skånetrafiken ticket/information offices.
- Recommendation 5 – The technical difficulties that were encountered in bringing together what were essentially incompatible databases should have been identified by and initial scoping exercise and risk assessment, which could have helped identify potential problems and remove the uncertainty regarding final implementation date by allowing appropriate revision of the implementation planning.
- Recommendation 6 – In barrier 1 and in other places in this document, there has been emphasis placed on the need for a Z-axis in the geographic data basis that is linked to the planning tool in the cases where topographic conditions call for this. Another matter that has not been considered at all by the measure leader or others involved in the project is meteorological. Prevailing winds will tend to reduce cycling times in certain directions and increase cycling times in other

directions. This measure could be improved in a later version (and should be considered in other cities watching this measure) with a real-time weather function: based on weather forecasts during the coming 24 hours, the travel planner would incorporate predicted wind direction and wind speed into a cyclist's route at the times the trip by bicycle would be undertaken. In a flat urban area, topography does not noticeably effect cycling times but weather conditions will.

Transferability

Although the implementation of this measure has been difficult at times potential for transferability exists as a concept to cities which have similar infrastructure opportunities to integrate cycling into a wider transport network and willingness ability to introduce cycling information system and travel planner on the internet. Information technology needed to support this measure is now readily available.

Components relevant to transferability of measure 12.4	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Services Offered				
	Provision of bicycle lane network on the travelling system on the internet	High	0	The bicycle lane network was added to the travelling-system on the web-page www.trafiken.nu and the trip planner on www.skanetrafiken.se to raise the consciousness of the people living in Malmö about the bicycle lane network and to show the possibilities to travel fast and safely by bicycle in Malmö. With the incorporation of the bicycle option together with the existing public transport and car options, the user can make a comparison not just between time and economy, but also between health aspects and environmental influence. This service is transferable as a concept to cities which have similar infrastructure opportunities to integrate cycling into a wider transport network and ability to introduce cycling information system and travel planner on the internet. This would require an already established travel planning website which can be complemented by travel information and advice on cycling.
Target Population				
	Citizens of Malmö Citizens of the Skäne Region	High	0	The purpose is to encourage a comprehensive view on the different aspects of travelling and to make people aware of the benefits of choosing a different means of transport other than the car. The measure is intended to raise people's awareness of how their planned travel affects the environment and the cost for the trip and to show sustainable alternative and to add a bicycle planning tool alongside other transport modes in an integrated package. Transferability potential exists where there is strong support for cycling and where users are familiar with accessing and using travel information on cycling on the internet. People's travel behaviour and need for travel also need to be taken into consideration to determine the likely levels of usage.
Geographical Area Covered				
	City of Malmö (everything within the borders of the municipality)	High	1	The measure is intended to help commuters and other travellers to find the best way of travelling between two places within Malmö, or between Malmö and other places in the Skåne region. This characteristic is transferable to cities and areas which have similar

Components relevant to transferability of measure 12.4	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
	Skåne Region (all municipalities in the region)			infrastructure opportunities to integrate cycling into a wider transport network and willingness and ability to introduce similar travel planning information services to encourage and promote cycling.
Finances				
	Operating costs	High	1	Operating costs are the costs of personnel, travel and subsistence, consumables, subcontracting and overheads. This characteristic is transferable where there are available resources as there will be costs associated with establishing and running of such scheme. It may worth for cities which plan such scheme seeking funding similar to SMILE project.
Stakeholders' Involvement				
	City of Malmo transport department	High	0	City of Malmo transport department acted as project initiator and manager. Transferability can be achieved where there is an authority or organisation which as able and willing to introduce and manage such measure.
	City of Malmo planning department	High	1	City of Malmo city planning department provided mapping information and experience. Transferability has potential where participating stakeholders have capacity and resources to provide such services.
	Private consultants	High	0	Private consultancy was employed for the development of the software. Transferability can be achieved where there is a coordinated approach to providing such services and where companies exists which are willing and able to provide necessary services required for successful operation of such schemes. A different private consultancy was employed for the development of the web interface. Transferability can be achieved where there is a coordinated approach to providing such services and where companies exists which are willing and able to provide necessary services required for successful operation of such schemes.
	Regional authority	High	1	Regional authority (Skånetrafiken) is responsible for the website on which the trip

Components relevant to transferability of measure 12.4	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
	(Skånetrafiken)			planner is based, although it was not an active participant in the technical development Transferability exists where the authorities offer their support and influence their decision for uptake of such measures.
Technical requirements				
	Travel system website on the internet	High	2	An existing travel planning website is hosting information on bicycle lane network. Transferability can be achieved where there are internet sites of similar travel planning services in use by potential users.
	Bicycle lane network	High	1	This involved making a ‘bridge’ layer connecting NVDB (National Road Data Base) and GC-nets (Walking- and Cycling-lanes); patching road net with z-coordinates from terrain height database; adapting existing travel planner, RoadElmer, to handle the digital map; create a new entry page for the existing travel planner; adapting user interface to allow for via locations; adapting the route display pages of existing travel planner. This characteristic is transferable where there are technical resources available to develop such service.
Implementation and Management Aspects				
	Management	High	-1	This measure has had a prolonged and protracted delay. There was an opportunity to test and evaluate an interim version of the tool during 2006 or 2007 but the decision was taken not to do so. There was reluctance to test an incomplete bicycle planning tool mid-way through SMILE and learn from the results. Testing and evaluation at that stage could have demonstrated whether further improvement of the tool was necessary and in what areas the potential users required changes to be made. Transferability is not appropriate where similar managerial issues can affect implementation and evaluation of the measure.

Components relevant to transferability of measure 12.4	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Awareness and Communication				
	Awareness and acceptance	High	0	Because of the difficulty of the measure to be in place and the uncertainty of when it might be rolled out, is has been difficult to collect direct evidence of awareness and acceptance. The indirect evidence collected from polling the general public has not been conclusive and some of the results appear to be contradictory. Nevertheless the evaluators would like to suggest that between 3-18% of the general public may be aware of the measure and interested in using it to some degree. Potential for transferability exists where well planned marketing and consultation exercises can raise the level of awareness amongst population. Also, an appropriate survey process needs to be in place which can measure increase in levels of awareness and acceptance.
Wider Issues				
	Culture / lifestyle	Low	0	Information technology has become an integral part of our lives and travel planning information is now readily available by the use of various communication channels. This measure has a potential for transferability considering advancements in information technology, software availability and the move toward information based societies. This needs to be complemented by a good marketing approach to ensure raising awareness and acceptance and promotion of cycling and all its associated benefits.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 10 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	0	208,000	0	-208,000	-208,000
Year 2	0	30,000	0	-30,000	-238,000
Year 3	0	136,000	0	-136,000	-374,000
Year 4	0	540,000	0	-540,000	-914,000
Year 5	0	110,000	0	-110,000	-1,024,000
Year 6	0	55,000	0	-55,000	-1,079,000
Year 7	0	55,000	0	-55,000	-1,134,000
Year 8	0	55,000	0	-55,000	-1,189,000
Year 9	0	55,000	0	-55,000	-1,244,000
Year 10	0	55,000	0	-55,000	-1,299,000
Total	0	1299000	0	-1,299,000	
NPV	0	1123917	0	-1123917	
Average net present annual cost				-112392	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	0	116284	0	-116284
NPV	0	100611	0	-100611
Average net present annual cost				-10061

The indicators chosen and monitored for measure 12.4 (focusing on awareness of the new service) have not been converted into emissions and so are not included in this cost effectiveness evaluation.

3.1.22 Measure 12.7: Bus Priority System

To improve public transport in the urban and suburban area of Malmö bus priority systems were implemented in 42 intersections. The intersections were equipped with new hardware for communication with the buses and the software of the roadside controllers in the intersections was programmed to give buses priority. Onboard the buses the computer managing the destination sign is programmed to communicate with the roadside controller for priority. The communication between the bus and the intersection is managed by the same system used for the real time application in measure 12.1.

Key Results

Summary of key evaluation results:

- Bus priority at intersections increases the travel speed for the buses by at the most 1.4 km/hour during afternoon peak. During other times the travel speed increased by 0.6-0.7 km/hour.
- Bus priority does not imply more delay for other traffic. In fact, it meant less delay as a whole for those three intersections evaluated. Depending on the intersection, the delay decreased by 0-1% during off peak periods, 2-14% during the morning peak and 0-13% during the afternoon peak. This would probably not be the case for optimized signal systems.
- Bus priority means increased punctuality for the buses. The variation of driving times for a specified distance is smaller with bus priority and as a result of that, the percentage of departures “in time” (departure not earlier than 30 seconds and not later than 3 minutes after time table) have increased by 2-5% for the bus line studied.
- The introduction of bus priority at the selected intersections did not have a significant enough impact to decrease the service intervals from 10 minutes to 7.5 minutes without increasing the amount of buses

Recommendations

- Recommendation 1 - incorporate the installation of bus priority system with a wider transport strategy.
- Recommendation 2 – to measure the success of bus priority system and evaluate its results the system need to be in place and running for some months; after surveys need to be repeated again to gain better and more reliable data and results of this system
- Recommendation 3 – it is recommended to support the bus priority system by marketing and promotion of bus journey reliability to attract more users and achieve modal switch and its associated benefits

Transferability

A potential exists for transferability of this measure. Where information technology can benefit the society and aid process of modal switch and increase in perception and usage of public transport with its associated benefits its use and availability needs to be encouraged. Prioritised traffic lights system at interchanges can improve bus journey times and reliability and make bus travel more attractive to existing and potential users and can also achieve modal switch and increase environmental benefits.

Components relevant to transferability of measure 12.7	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Services Offered				
	Prioritised traffic lights system	High	0	To improve public transport in the urban and suburban area of Malmö bus priority systems were implemented in 42 intersections. The intersections were equipped with new hardware for communication with the buses and the software of the roadside controllers in the intersections was programmed to give buses priority. Onboard the buses the computer managing the destination sign will be programmed to communicate with the roadside controller for priority. This characteristic is transferable to cities where such information technologies exist and where the authorities and transport service providers have willingness, ability and capacity to provide such service.
Target Population				
	Bus travellers Car drivers	High	0	Commuters in the urban and suburban area of Malmö and the region of Skåne can benefit from prioritised traffic lights system. A faster public transport gives a better alternative to car when travelling in the city. This characteristic has a potential for transferability where there is adequate provision of bus network and availability of necessary technology as the commuters can benefit from better and more reliable bus services. People's travel behaviour and need for travel also need to be taken into consideration to determine the success of this measure in a particular city. With regards to car owners, achieving modal shift and its associated benefits is supported in many urban areas and therefore this characteristic has a potential for transferability. However, issues such as level, efficiency and convenience of bus services, people's travel behaviour and need for travel also need to be taken into consideration to determine the likely levels of modal shift.
Geographical Area Covered				
	42 intersections in the city of Malmö, urban and suburban area of	High	1	All buses operating in Malmö are included and 42 intersections within Malmö are also included in this measure.

Components relevant to transferability of measure 12.7	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
	Malmö and the region of Skåne			Transferability can be achieved where there is adequate provision of bus network and its supporting infrastructure, where such information technologies exist and where the authorities and transport service providers have the willingness and capacity to provide such service.
Finances				
	Operating costs	High	2	Operating costs are the costs associated with staff and subcontracting. This characteristic is transferable as there will be costs associated with establishing and running of such scheme. It may worth for cities which plan such scheme seeking funding similar to SMILE project.
Stakeholders' Involvement				
	Streets and Parks Department of City of Malmö Skånetrafiken, a principal participant responsible for public transport in the region of Skåne and in city of Malmö Public transport users Supplier of modems	High	0	Traffic light priority systems are one of the most important actions to increase bus accessibility, improve journey time reliability and increase attractiveness of bus travel and may be the action that can be most effective. This characteristic is transferable where the co-ordination between all relevant stakeholders exists for successful implementation and provision of similar systems. The authorities can offer their support and influence their decision for uptake of such measures.
Legal or Contractual Requirements				
	Contracts	High	1	Contracts would have been set up between Skånetrafiken and their subcontractor

Components relevant to transferability of measure 12.7	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				to provide the necessary equipment and support services. Transferability exists where such contractual arrangements need to be in place for successful running of the project.
Technical Requirements				
	Modem Bus computers	High	0	Installation of modem was carried out by contractor for maintenance of traffic signals. Programming of bus computers was done by Skånetrafiken. Transferability can be achieved where such technology is available.
Awareness and Communication				
	Awareness and acceptance	High	0	The awareness and acceptance of potential and actual passengers for this measure is important. If there is no awareness of the increased travel speed and the decreased headways, there will be no change in travel behaviour. The bus priority was in place during late spring 2008 and the effects of next time table in terms of changes in headways are still to come. Prior studies in SMILE though show the importance of travel time. Transferability needs to be encouraged where similar measures can improve reliability of bus journeys as this has wider benefits. Also, appropriate survey process and evaluation methodology needs to be developed and used to determine the increase in levels of awareness and acceptance. It is also recommended to support the bus priority system by marketing and promotion of bus journey reliability to attract more users and achieve modal switch and its associated benefits.
Wider Issues				
	Wider benefits	Low	0	It would be technically possible to install bus priority system at all intersections in Malmo to achieve greater bus reliability for all bus services and increase attractiveness of travelling by bus. More travellers will benefit from better and more reliable bus journeys which will result in an increase in the number of

Components relevant to transferability of measure 12.7	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				journeys and achieve the modal switch to public transport. This measure has a potential for transferability considering advancements in information technology and software availability. Transferability can also be encouraged where measures have benefits for a wider population using public transport.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration:	14 years				
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	1,152,745	0	0	-1,152,745	-1,152,745
Year 2	1,279,665	0	0	-1,279,665	-2,432,410
Year 3	1,482,418	0	0	-1,482,418	-3,914,828
Year 4	236,273	0	0	-236,273	-4,151,101
Year 5	0	30,000	0	-30,000	-4,181,101
Year 6	0	30,000	0	-30,000	-4,211,101
Year 7	0	30,000	0	-30,000	-4,241,101
Year 8	0	30,000	0	-30,000	-4,271,101
Year 9	0	30,000	0	-30,000	-4,301,101
Year 10	0	42,500	0	-42,500	-4,343,601
Year 11	0	50,000	0	-50,000	-4,393,601
Year 12	0	57,500	0	-57,500	-4,451,101
Year 13	0	65,000	0	-65,000	-4,516,101
Year 14	0	72,500	0	-72,500	-4,588,601
Total	4151101	437500	0	-4,588,601	
NPV	3851299	306818	0	-4158116	
Average net present annual cost				-297008	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	371600	39164	0	-410764
NPV	344762	27466	0	-372227
Average net present annual cost				-26588

The indicators chosen and monitored for measure 12.7 (focusing on marginal time savings at individual and groups of signals and their impact on the wider bus service) have not been converted into emissions and so are not included in this cost effectiveness evaluation.

3.2 Norwich

3.2.1 Measure 5.4: Alternative Fuel Vehicle Fleets

Through trials conducted in and around the city of Norwich this measure demonstrated:

- the provision of a biodiesel and biodiesel blend supply chain
- the technical feasibility of using biodiesel at a range of blends in urban vehicle fleets, including the bus operators, Anglian and First, and taxis.

The measure also provided an evaluation of the implications of using biodiesel in the UK, in an environmental context, including its effect on CO_2 and other emissions. Primarily biodiesel from waste oil was used, because this material offered significantly higher greenhouse gas savings than biodiesel from virgin plant oils. After experiencing various problems with the original supplier of biodiesel, another supplier, Argent Energy Ltd, was identified to provide a high quality pure biodiesel product.

Key Results

The key results are as follows:

- The energy content per litre of the Argent biodiesel was approximately ten per cent lower than for ultra low sulphur diesel (ULSD). In proportion, this scales to a two per cent reduction for B20 biodiesel blend and a 0.5 per cent reduction for B5 biodiesel blend.
- Up to a blend of B20, fuel economy and NO emissions are no worse than for operation with B0 (ULSD). For higher biodiesel blends, there are indications that fuel economy may reduce by a few per cent, as expected due to the lower volumetric energy density of biodiesel compared to ULSD. For B100, the indications are that fuel economy is approximately ten per cent less than for ULSD, which scales very closely with the reduction in energy content per litre for Argent biodiesel compared to ULSD, and NO emissions may increase modestly.
- When greenhouse gas emissions are also considered, B20 is a cleaner fuel than ULSD. Use of B20 would generate a significant reduction in CO_2 emissions of around 600 tonnes per annum across the Anglian bus fleet (which operates across Norfolk).
- Therefore a B20 blend might be an optimum compromise in terms of fuel economy and CO_2 and NO emissions. This means that operation of buses in Norwich with B20 fuel will not cause any problems in respect of the city's Low Emission Zone (measure 6.2).

Recommendations

- Recommendation 1 - B20 is a recommended biodiesel blend for fleet operators, balancing operational and environmental factors.
- Recommendation 2 – Norwich and Norfolk pursue the ambition of becoming the UK's leading authority in the use of low-carbon fleet vehicles.
- Recommendation 3 – Since the inception of the project, the understanding of possible indirect effects of biofuels has been transformed. Two papers were published in Science in February 2008. Subsequently the UK Renewable Fuels Agency (which did not exist when the project began) published the Gallagher Report on the Indirect Effects of Biofuels. The UK Government accepted its recommendation to slow down the mandate for biodiesel production and to sharpen focus in

future years on second-generation biofuels. Further action on biofuels must be based on knowledge and expertise of these complex issues, and ideally should focus on second-generation fuels that do not create potential displacement effects.

- Recommendation 4 – Where possible the use of waste oil, as in this measure, provides the optimum solution for biofuel use in transport applications. However, the volume of fuel that can be obtained from such sources is limited. It requires further review which is beyond the scope of a city-level investigation such as this. Norwich measure staff were very interested to learn about the use of biogas by Malmo (measure 5.2), and it is recommended that they make serious efforts to promote compressed natural gas (CNG) and biogas fuel for use by heavy vehicles in the UK.

Transferability

Key factors to consider when transferring the measure elsewhere are: development and management of stakeholder partnerships to ensure the production, storage and distribution of biodiesel of appropriate quality, and the extent to which fuel use by vehicle fleet operators is regulated through national law.

Components relevant to transferability of measure 5.4	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Stakeholders' Involvement				
	Stakeholders supplying, storing and distributing fuel Bus operators	High Medium	 0	The intended supplier of the biodiesel for use in vehicle fleets was Global Commodities. It was bankrupted without warning during measure implementation. There was also a significant problem with the quality of the fuel Global Commodities proposed to supply (see 'Technical requirements'. Another supplier, this time of high quality biodiesel, was identified. However, a company also had to be found to store and distribute the product. This was challenging. The problems with stakeholders led to considerable delays in the project (see also 'Management'). One of the major bus operators had withdrawn from participating in the measure, due to problems with sourcing biofuel. However, following the appointment of a new Managing Director for the region, the operator found an alternative supplier and have had all their bus fleet in Norwich running on a biodiesel blend since 2007. Problems have been experienced in obtaining buses to run trials. All buses in one operator's fleet are in service during the week and testing has to be conducted at weekends; sometimes there are no drivers available. It is difficult to assess relevance to transferability. Other cities contemplating this measure will need to address how biodiesel of appropriate quality will be supplied, stored and distributed, and what stakeholder partnerships should be formed to achieve this. Vehicle fleets which can use the fuel will also need identifying, which could involve liaison with operators of buses, taxis and public service vehicles, for example.
Legal Requirements				
	Economic Incentives	High	0	The measure leader reported that there is unlikely to be significant up-scaling of use of biodiesel in the vehicle fleets within this measure, mainly due to lack of economic incentive for bus operators to use biodiesel.). There are no regulated incentives or tax breaks when using higher blend biodiesel. Grant funding is

Components relevant to transferability of measure 5.4	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				available for UK bus service operators but the rules attached to this prevent biodiesel being used in public funded bus services. In the UK, bus operators are free to choose which fuel to use on a cost basis, whereas in some other EU countries the authorities can require particular renewable fuels to be used. It is difficult to assess the implications for transferability as this will depend on the extent to which fuel use by fleet operators in other countries is regulated.
Technical Requirements				
	Type of biodiesel used quality	High	1	It became clear that the biodiesel manufactured by Global Commodities did not comply with required standards. However as noted above, another supplier of suitable quality biodiesel was found. Through the experience of working on this measure, the measure leaders have a) assisted local biodiesel suppliers in improving the quality of their product and b) created a supply network in the region that makes available high quality biodiesel blends at all concentrations to fleet operators. The measure utilised biodiesel manufactured from used oil. Biodiesel produced from virgin oil tends to be of higher quality, but there are issues with sustainability because of the greenhouse gas emissions during crop growth. Other cities interested in this measure could particularly benefit from Norwich experience and advice on development and supply of high quality biodiesel. They should also take account of recent research on indirect effects of biofuels in their future use - again the measure leaders could provide information on this.
	Monitoring	Medium	0	Monitoring activity within the measure is significant. There were problems associated with availability of buses for emissions measurement, and technical issues concerning integration of electronic data gathering and engine management systems. The measure is receiving help with emissions measurement, as monitoring of exhaust emissions of nitrogen oxides from buses using biodiesel will be covered by evaluation within another SMILE measure, a low emission zone. Other cities contemplating this measure will need to consider arrangements for monitoring.

Components relevant to transferability of measure 5.4	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Management				
	Management of stakeholder relationships	High	0	The measure leaders are based at the University of East Anglia (UEA). They had to respond quickly to the problems caused by Global Commodities going bankrupt. They were able to draw on UEA's expertise in negotiating with new commercial partners with no history in the project and to convince them to take part. Whilst other cities considering implementation of this measure may not experience the same problems as in Norwich, they would still need to provide strong management of stakeholder partnerships.
Wider Issues				
	Fuel price rises and climate change	Medium	1	The measure will continue to exploit stakeholder and public concerns about fuel price rises and climate change to promote use of alternative fuels. Such concerns may well exist elsewhere. The measure leader noted that: • there will be an incentive for fleet operators to subsidise fuel costs by using slightly cheaper biodiesel blends, but that the price of biodiesel is also rising as production increases and input costs increase • fleet operators can highlight the use of biodiesel as an alternative fuel to market themselves as being carbon conscious.

Costs, Revenues and Cost Effectiveness

When the cost effectiveness of the other measures is considered this is generally through the cost of design, implementation and operation of the SMILE project measure. The nature of measure 5.4 is rather different, in that it has largely focused on providing the research basis to validate a particular strategy in relation to the development of a supply chain for sustainable biodiesel together with taking steps to demonstrate the optimal environmental situation taking into account lifecycle CO_2, local pollutant and sustainability issues.

When considering the cost effectiveness of this measure it is largely dependent upon the cost of operation, and particularly the fuel cost, as for existing diesel vehicles significant upgrades to infrastructure would not be expected for operation at the B20 blend of biodiesel considered as optimal in the research findings.

Like other fuels the cost of producing biodiesel is subject to market fluctuations as input costs vary. Observations of this market in recent years suggest that the final cost of biodiesel to the consumer in the UK (which has not included any fuel duty cost element) has been the same or marginally more expensive than the full commercial cost of ULSD. The cost of ULSD does include a significant cost element of fuel duty, which can largely be reclaimed by bus operators through the bus service operators grant (BSOG - although this is potentially subject to change with a consultation by the UK government ongoing). The result of BSOG is that for bus operations it is actually beneficial not to operate a biodiesel bus at a blend of biodiesel greater than B5, which has been offered similar status under BSOG regulations as ULSD.

Therefore, for the following cost effectiveness analysis the net effect of using B20 rather than ULSD for a bus operator such as Anglian Buses would be an increased cost of around 2 to 2.5 pence per litre. Anglian have quoted a fuel use of around 100,000 litres per month, so this additional cost would be in the order of £24,000 to £30,000 per year, in order to deliver the 600 tonnes of life cycle CO_2 reduction quoted as the potential impact of this measure in their fleet.

This gives an indicative cost effectiveness value of £40 - £50 per tonne of CO_2, or €50 - €63 per tonne of CO_2 using the same purchasing power parity factor as applied to the other measures.

3.2.2 Measure 6.2: Introduction of a Low Emission Zone (LEZ)

Within Norwich city centre an air quality management area (AQMA) was declared due to levels of nitrogen dioxide (NO_2) pollution. There was also a perceived problem associated with particulate (PM_{10}) pollution and black smoke. The area of the LEZ was centred on one street adjacent to Norwich castle, Castle Meadow. Vehicular traffic within the street was limited to buses, taxis, delivery vehicles and the emergency services. It was intended that the LEZ should comply with:

- UK regulation (40µg/m^3 [21ppb]) for annual average NO_2 levels
- a future UK objective (20µg/m^3) for annual average PM_{10} levels.

By implementing a Traffic Regulation Condition (TRC) under environmental grounds, Norwich City and Norfolk County Councils regulated bus emissions in the LEZ. It was required that a certain percentage of a bus operator’s fleet met set emission criteria. To aid bus operators in meeting the new emission standards, Norfolk County Council made grants available for any operator wishing to retrofit their fleet vehicles with pollution reducing equipment. Grants were also made available to taxi operators wishing to convert their vehicles to liquid petroleum gas (LPG). A number of fire service vehicles were also retrofitted.

A Traffic Regulation Order was also implemented. This required all vehicles waiting in the LEZ to switch their engines off except when passengers were boarding or exiting buses. Eco-driver training was also promoted. Free places on a half day course were offered to all affected bus operators.

Data on NO_2 levels were collected from diffusion tubes (all sampling locations had duplicate tubes allocated to measure precision and accuracy of the original tubes), static air quality monitoring stations and mobile units. Triplicate control tubes were placed at the Norwich city centre background air quality station and the mobile air quality station sited in Castle Meadow. An arbitrary ‘background’ comparison diffusion NO_2 sample tube was positioned near to the main bus stop at the University of East Anglia (UEA). Particulates were measured in the Castle Meadow air station. Telephone interviews were undertaken to assess levels of public awareness of the measure. There were 808 respondents.

Key Results

The key results are as follows:

- The LEZ became operational in July 2008, regulated via the Traffic Regulation Condition (TRC). Monitoring will continue past the life of the SMILE project.
- Following the implementation of the LEZ, 75.9% of interview respondents either strongly agreed or tended to agree that the introduction of low emission zones in Norwich would reduce pollution and bring health benefits for people living and working in Norwich.
- Regarding proposed conversion of taxis to LPG, the technology for this is still in its infancy, and taxi operators were reluctant to commit time and financial resources to an untried technology. Therefore no taxis were converted. However it is still hoped that as technology and public acceptance of environment issues increase, some taxis will be converted in the near future.
- 25 buses owned by the operator First were retrofitted, using Selective Catalytic Reduction (SCR) technology. In addition, two buses from the operator Neaves underwent retrofitting and a contribution was made to a Norwich city tour bus in order to fit a new Euro IV engine.
- 30 fire service vehicles were retrofitted.
- Complementary measures were implemented, including the engine switch off Traffic Regulation Order (TRO) and 92 free eco-driver training sessions.
- It is clear that the ‘natural evolution of bus fleets will not bring fast enough changes to lower NO_2 levels to meet UK Government guidelines. This is due to the age of the main First bus fleet and the small number of new vehicles purchased over two year intervals. It was found that bus fleets have the dominant influence on air pollution and air quality in the LEZ.

Recommendations

- Recommendation 1 - Consideration should be given using of a TRC (or similar regulatory instrument outside the UK) instead of a TRO as a regulatory tool for a LEZ. The TRC provides greater flexibility, recognising that in the short term it may not be cost effective to retrofit buses which infrequently enter the LEZ. This approach also allows operators more time to comply and for compliance costs to be spread over a number of years.
- Recommendation 2 - As LEZs become more common throughout Europe, it would be beneficial to have a consistent approach to them. There should be similar criteria to admit or exclude vehicles throughout Europe with regard to signage and required emission levels.

- Recommendation 3 - It is important to encourage local availability of cleaner alternative fuels especially LPG. This was a major factor delaying the conversion of diesel taxis to LPG.
- Recommendation 4 – It is beneficial to share experiences and problems with other interested bodies such as other councils. Low Emission Strategies Forums are good sources of information sharing.
- Recommendation 5 - Consideration should be given to promoting measures which result in benefits for both air quality and climate change. Ensure that abatement technologies do not have disbenefits for CO_2 emissions and do not impinge on local/national commitments to reduce greenhouse gases. At a basic level, a measure that results in a 'win' for air quality and a 'win' for climate change would be one that reduces the emissions of all pollutants that are important to both issues relative to a business as usual case. Furthermore, in some cases there can be other trade offs. Some measures, for example, might reduce most air quality pollutants but result in the increased emission of another air quality pollutant. There are inherent methodological difficulties in identifying the impact of measures on emissions of pollutants of concern from an air quality perspective and those that have impacts, directly or indirectly, on climate. It is vital that councils consider emissions of greenhouse gases and air quality pollutants together, and it is important to develop a holistic approach to the control of NO_2 and PM.
- Recommendation 6 - It is paramount that early consultation is undertaken with bus operators and all other affected stakeholders at the earliest possible stage. It is important to work in partnership with bus operators to reduce vehicle emissions. They should be provided with assistance and information to help them identify practical solutions for retrofitting of emissions reduction equipment that will not unduly burden them financially.
- Recommendation 7 – The implementation of the LEZ could be taken up by other cities who have similar air quality issues to those seen in Norwich.
- Recommendation 8 - This project has focussed on a narrow range of pollutants (NO_2 and PM) and has considered air quality and not impacts on climate change. It is therefore difficult to assess the overall impacts of different measures on air quality and climate change issues. Some consideration should be given to cumulative emissions over a specified time period when assessing different measures.
- Recommendation 9 – Consideration should be given to developing better means of expressing the influence of air quality pollutants on climate, and for comparing the benefits of abatement strategies in respect of air quality and climate change.

Transferability

There appears to be reasonable scope for transferring this measure elsewhere. The measure leader recommends that implementation could be taken forward by other cities who have similar air quality issues to those in Norwich. Key questions to address when transferring the measure elsewhere are:

- What are the key reasons for taking this approach?
- how will set up and running costs be funded?
- how to engage stakeholders?
- what are the appropriate arrangements for data collection and monitoring?

Components relevant to transferability of measure 6.3	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Finances				
	Set up and maintenance costs	High	0	There were set up and maintenance costs associated with the measure, including providing and fitting pollution reducing equipment in vehicles, eco-driver training and monitoring of emissions. Other cities contemplating this measure will need to investigate funding sources for both set up and running costs.
Stakeholders' Involvement				
	Transport operators	High	0	Retrofitting of buses was required to ensure reduced emissions. The measure leader noted retrofitting of buses would have been easier in some other European countries, as they had more control over bus operators. In Norwich, involvement of bus operators was secured through regulation (see 'Legal requirements'). Most bus operators were also interested and participated in eco-driver training. It was originally proposed to convert 5 taxis from diesel to LPG operation. The technology for conversion is still in its infancy, and taxi operators were reluctant to commit time and financial resources to an untried technology. Therefore no taxis were converted. Early consultation was undertaken with transport operators and this is recommended to other cities interested in the measure. The measure leader highlighted the importance of working in partnership with operators to reduce vehicle emissions, providing them with assistance and information to help identify practical solutions for conversion/retrofitting at reasonable costs.
	Businesses in the LEZ	Medium	1	Another aspect of the measure required drivers of parked or waiting vehicles to switch off their engines, other than when loading or unloading passengers. Businesses were eager to see pollution reduced in the LEZ as they were concerned about air quality. They were very willing to encourage their delivery drivers to switch engines off when delivering to their premises. Transferability elsewhere will be influenced by the level of concern about air quality amongst the population of the intended zone. Other cities considering implementation of this measure may wish to identify and engage with businesses/other inhabitants and other users of the proposed zone.

Components relevant to transferability of measure 6.3	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Legal Requirements				
	Air quality legislation	Medium	0	The zone where low emissions were implemented was designated an Air Quality Management Area. As such there is a statutory requirement to take action to improve the area's air quality, in order to meet government guidelines.
	Traffic legislation	High	0	Regulations were used to facilitate measure implementation. A Traffic Regulation Condition (TRC) was attached to public vehicle operators' licenses on environmental grounds. This enabled regulation of bus emissions by requiring that a certain percentage of a bus operator's fleet meet set emission criteria. The TRC application process was particularly onerous, however. Engine switch off of parked or waiting vehicles was secured through a Traffic Regulation Order. It is difficult to assess transferability, because this will depend on the existence and nature of legislation in other countries, and what can be achieved without regulation. Where other cities do use legislation to enforce the measure, they may wish to clarify how much time and what information will be needed in order to move through the regulatory process
Technical Requirements				
	Use of new technology	Medium	0	New technology was utilised to reduce and monitor vehicle emissions. Other cities interested in this measure may find advice and experience from Norwich particularly useful when considering technical requirements.
Implementation				
	Scheme definition criteria	Medium	1	The criteria for operating the LEZ require certain vehicle operators to meet specific emissions standards. There is a two tier approach, as buses entering the zone more frequently have to meet stricter emissions criteria than less frequent buses. The criteria will become progressively more stringent until 2010. (See also 'Legal requirements' concerning enforcement of criteria.) Other cities contemplating this measure should consider what and whether differential criteria could be applied, and whether these might change over time. It would be useful to

Components relevant to transferability of measure 6.3	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
	Data collection and monitoring	High	0	draw on advice from Norwich, but these questions will also be influenced by availability of resources to support introduction of criteria and attitudes of stakeholders involved. The measure leader recommends that if LEZs become more common throughout Europe, it would be beneficial to have a consistent approach to them, with similar criteria to admit or exclude vehicles. To implement the measure, a large amount of data had to be collected, which took considerable time to process. Some data was difficult to obtain and a proxy had to be used. (See also 'technical requirements'). Monitoring and evaluation of the measure until 2010 will be undertaken by the local university, Norwich City Council and Norfolk County Council. This should allow the LEZ to be refined and further developed. Data collection and monitoring is another area where other interested cities could particularly benefit from advice from Norwich.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration:	10 years				
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	158,000	3,000	0	-161,000	-161,000
Year 2	386,000	3,000	0	-389,000	-550,000
Year 3	0	3,000	0	-3,000	-553,000
Year 4	0	3,000	0	-3,000	-556,000
Year 5	0	3,000	0	-3,000	-559,000
Year 6	0	3,000	0	-3,000	-562,000
Year 7	0	3,000	0	-3,000	-565,000
Year 8	0	3,000	0	-3,000	-568,000
Year 9	0	3,000	0	-3,000	-571,000
Year 10	0	3,000	0	-3,000	-574,000
Total	544,000.00	30,000.00	0.00	-574,000	
NPV	512992	24950	0	-537942	
Average net present annual cost				-53794	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	689061	38000	0	-727061
NPV	649785	31603	0	-681388
Average net present annual cost				-68139

The focus of the measure on air quality measurements within the low emission zone as the direct quantifiable outputs, which are subject to many other influences, makes it difficult to express the cost effectiveness in a comparable way to the other measures.

As an indirect impact, estimated solely for the cost effectiveness assessment, it is possible to consider the effect of retrofitting continuously regenerating particulate trap / SCR technology to the 25 Neaves buses, which was driven by the implementation of the LEZ regulations. This impact is estimated based on the NOx emissions from a single deck Euro 2 bus travelling an average of 40,000 miles per year with and without SCR technology. This was conducted using emissions data from COPERT emissions model and operational experience of the impact of SCR technology on NOx emissions.

The resultant reduction in NOx emissions is 19.7 tonnes per year, and in PM_{10} of 430 kg per year which will be distributed throughout the area in which the Neaves buses operate, not just the Low Emission Zone.

Taken on an annual basis using the figure of £10,000 retrofitting cost per bus quoted in the measure evaluation template for a five-year equipment lifespan, the cost effectiveness values are £2.54 per kg of NOx, or €3.21 per kg of NOx and £116.3 per kg of PM_{10}, or €147.3 per kg of PM_{10}, using the purchasing power parity factor applied to the UK pound.

3.2.3 Measure 6.3: Introduction of Time Controlled Access Restrictions

The purpose of this project was to create 2 streets within Norwich where pedestrians own the street at certain times of the day, either during the core shopping hours e.g. 10am to 4pm or during the evening when bars and restaurants are at their busiest e.g. 7pm to 1am. It was expected that during the pedestrian hours there may have to be some access retained for loading, cyclists and possibly buses. Outside these hours the street would be used by general traffic. This is contrary to the accepted norm for pedestrianised streets where admittance outside pedestrianised hours is usually reserved for access and loading. It raised road safety challenges that needed to be addressed through sensitive ‘pedestrian, cyclist and bus friendly’ speed management.

Note two streets were originally identified for introduction of time controlled access restrictions, Westlegate and Exchange Street, in Norwich city centre. Neither proposal received political approval from local government, although one did have public support. Restrictions were subsequently applied in two other city centre streets, St Benedicts and St Georges. The St Benedicts Street restrictions were cancelled after 6 weeks due to opposition from traders after implementation. In St Georges Street a physical closure to traffic was implemented rather than time restrictions. This is set to continue.

Key Results

The key results are as follows:

- For part time pedestrianisation schemes to work there needs to be a clear reason for closing the street, and this needs to be communicated to businesses and the public.
- If a street is re-paved to provide a shared use surface, this visual prompt can deter drivers from using the street. In St Georges traffic volumes halved following implementation of the restrictions.
- The St Georges Street scheme suggests that by making a street more attractive to pedestrians, it can encourage people to use the street more often for discretionary trips.
- Re-paving a street to provide a flush surface, while slowing vehicle speeds, does not necessarily reduce speeds enough to make pedestrians feel safe using the street.

Recommendations

- Recommendation 1 – The location and physical characteristics of streets should be taken into account when considering time controlled access restrictions. To aid implementation and enforcement, streets should have a very limited number of points of entry, and should not give access to significant amounts of off street parking to which access needs to be maintained.
- Recommendation 2 – Consider the justification for implementing time controlled access restrictions on a particular street. When choosing a street that should have these restrictions, it is important that the public can see a reason why the street is closed at certain times and not at others, otherwise enforcement will become an issue.
- Recommendation 3 – Stakeholder involvement should be properly managed. While it is essential to involve stakeholders, care should be taken not to rely on the views of a small group. Effort should be made to consult all stakeholders at an early opportunity.

- Recommendation 4 - Consider economic climate. When this is uncertain, commercial interests may be quick to look for things to blame for any down turn in their fortunes. It is easy to attribute a road closure to a change in business patterns as the closure is tangible; in reality the closure may have no adverse affect on the business.
- Recommendation 5 – Politicians should be engaged at an early opportunity. A lot of time and effort was spent on the Westlegate Scheme that was ultimately rejected by the politicians.

Transferability

The measure leader recommends that, to aid implementation and enforcement, streets being considered for time controlled access restrictions should have limited points of entry, and not be linked to significant amounts of off-street parking to which access needs to be maintained. Other key factors to address when transferring the measure elsewhere are: how set up and running costs will be financed, arrangements for identifying and engaging with stakeholders who will be affected, and how the measure can be enforced in practice.

Components relevant to transferability of measure 6.3	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Finances				
	Cost of traffic management	High	0	Various forms of traffic management had to be installed to implement time controlled access restrictions on one street, i.e. advance signing, barriers and cones. Ongoing costs were £500 per day, although the restrictions were cancelled after 6 weeks due to opposition from traders after implementation (see 'Stakeholders involvement'). Other cities considering implementation of this measure will need to investigate funding sources for set up and ongoing costs.
Stakeholders' Involvement				
	Political, street traders' and public support	High	0	Securing and maintaining stakeholders' support proved challenging. This was due to varying levels of support arising from different priorities and agenda amongst stakeholders (in terms of the impact restrictions could have on activities and environment in the streets were the measure was proposed and surrounding areas). Two streets were originally identified in which the measure could be implemented. Neither proposal received political approval from local government, although one did have public support. Only one alternative street was identified for measure implementation, although in another street pedestrianisation was implemented rather than time restrictions. Regarding the street where time restrictions were introduced, consultation with a street traders' association showed they were initially supportive; however once restrictions had been implemented, the association and other traders were not happy with them. It is difficult to assess the relevance to transferability elsewhere, as this will depend on local priorities of stakeholders and the degree of control exercised by local governments. However it is recommended that other cities working on this measure identify all stakeholders who could be affected by implementation, and undertake early and representative consultation and engagement with these stakeholders. The measure leader also recommends that when choosing a street for time controlled access restrictions, it is important that stakeholders can see a clear reason why it should be closed at certain times and not others.

Components relevant to transferability of measure 6.3	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Legal Requirements				
	Licensing for seating outside street outlets	Low	0	To complement pedestrianisation in the street with time restrictions, it was planned that food and drink outlets should provide outside seating. However, each venue would have required a licence to do so, the cost of which was prohibitive. Transferability will be influenced by the existence and nature of licensing rules in other cities.
Implementation				
	Lack of enforcement	High	0	In both the street with time restrictions and the pedestrianised street, there was no enforcement of the measure by the police. Road safety concerns due to drivers ignoring restrictions were a major factor in withdrawing time restrictions on one street and replacing pedestrianisation with a physical closure on the other. Other cities interested in this measure should consider how it can be enforced in practice, working in conjunction with local police and other stakeholders.
Wider Issues				
	Economic Factors	Medium	0	As noted above, in the street' with time restrictions, traders were initially supportive prior to implementation, but not keen once restrictions had been effected. This may partly have been due to the downturn in the retail climate which is likely to be an issue elsewhere.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 20 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	1,960	0	0	-1,960	0
Year 2	1,490	0	0	-1,490	0
Year 3	266,705	0	0	-266,705	0
Year 4	94,750	0	0	-94,750	0
Year 5	0	1,420	0	-1,420	0
Year 6	0	1,420	0	-1,420	0
Year 7	0	1,420	0	-1,420	0
Year 8	0	1,420	0	-1,420	0
Year 9	0	1,420	0	-1,420	0
Year 10	0	1,420	0	-1,420	0
Year 11	0	1,420	0	-1,420	0
Year 12	0	1,420	0	-1,420	0
Year 13	0	1,420	0	-1,420	0
Year 14	0	1,420	0	-1,420	0
Year 15	0	1,420	0	-1,420	0
Year 16	0	1,420	0	-1,420	0
Year 17	0	1,420	0	-1,420	0
Year 18	0	1,420	0	-1,420	0
Year 19	0	1,420	0	-1,420	0
Year 20	0	1,420	0	-1,420	0
Total	364905	22720	0	-387,625	
NPV	326406	14966	0	-341372	
Average net present annual cost				-17069	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	462209	28778	0	-490988
NPV	413445	18957	0	-432401
Average net present annual cost				-21620

The indicators chosen and monitored for measure 6.3 (focusing on awareness, business acceptance and broader quality of life issues and consultation issues) are not suitable for inclusion in this cost effectiveness evaluation.

3.2.4 Measure 7.2: Influencing the Choice of Vehicle Towards Smaller and More Fuel Efficient Vehicles

There has been a historic tendency for commuters to park in the residential streets within and surrounding Norwich city centre. These areas are compact and characterised by narrow terraced housing streets with parking on both sides of the street. Over the past 10 years there has been a programme of designating these residential areas as Controlled Parking Zones (CPZ). These have parking restrictions linked to a permit system. Due to a recent increase in car ownership levels, there was a need to review the criteria for issuing and cost of parking permits. Subsequently revised criteria and permit charges were implemented, based on vehicle length. The main aims were to:

- encourage changes to smaller and more fuel efficient vehicles
- free up kerb space and improve the environment in the residential areas by reducing the number of vehicles parked.

Key Results

The key results are as follows:

- The introduction of permit charges that favour smaller vehicles has the potential to reduce overall fuel consumption in the population of cars with permits.
- The introduction of permit charges that favour smaller vehicles has the potential to reduce overall CO_2 emissions in the population of cars with permits. The following table shows the potential effect on emissions of changes in average vehicle length, assuming that in time the measure does have the desired impact on vehicle length and there is no change in number of cars with permits.

	Existing	**5% reduction in average vehicle length**	**10% reduction in average vehicle length**
Average vehicle length (m)	4.12	3.91	3.71
CO_2 emission (g/km)	151	142	134
Number of vehicles	8249	8249	8249
Annual CO_2 emissions (t)	23918	22506	21176
Change in CO_2 emissions (from existing)		-1412	-2742

- There remain potential fuel consumption and CO_2 emission benefits even if the additional available kerb space created is used by new vehicles. The following table shows the effect on emissions of changes in average vehicle length, assuming additional kerb space is used to park additional vehicles.

	Existing	**5% reduction in average vehicle length**	**10% reduction in average vehicle length**
Available kerb space (m)	60203	60203	60203
Average vehicle length (m)	4.12	3.91	3.71
Average space to park (m)	5.50	5.23	4.95
Potential parking capacity	10945	11511	12162
Change (w.r.t. existing)		+566	+1217
Annual CO_2 emissions (t)	31738	31436	31222
Change in CO_2 emissions (from existing)		-302	-516

Recommendations

- Recommendation 1 - Consider undertaking ‘willingness to pay research: The revised permit pricing is based on retail price index information, resulting in a new pricing system that is price neutral overall. However the revised pricing may be insufficient to achieve behavioural change. ‘Willingness to pay’ research would help inform such pricing.
- Recommendation 2 - Consider charging based on emissions: There is a strong correlation between car length, engine size, fuel consumption, and carbon emissions. Any of these indices has the potential to determine differential pricing depending on the specific objectives to be achieved. This measure set out to increase practical parking capacity. However a scheme based on emissions might also result in similar outcomes and may be better understood by the public as . vehicle excise charges are now based on emissions for example.
- Recommendation 3 - Consider extensive public relations: The measure was generally well received, but nonetheless attracted adverse comment often from national organisations rather than the local media. The adverse publicity could be challenged and it is considered that with better information it could be avoided. However such activity is resource hungry and was not possible within the budget for this project.
- Recommendation 4 - Consider information systems at an early stage: The implementation of the measure was delayed due to information system issues (difficulties with software modifications and establishing a reliable database of car lengths). Changing/creating such systems often take longer than anticipated and will often determine a project’s critical path.

Transferability

There appears to be reasonable scope for transferring this measure elsewhere. The key (and related) factors to address when transferring the measure elsewhere are: how to secure public and political endorsement for the scheme, and design of criteria for scheme operation.

Components relevant to transferability of measure 7.2	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Geographical Area Covered / Existing Infrastructure				
	Parking in residential areas in or nearby city centre / Demographics	Medium	1	These factors in combination contributed to a need for increased control of parking in Norwich. Commuters often parked in the residential streets in and surrounding the city centre, within easy walking distance of their place of employment. These areas are compact and characterised by narrow terraced housing streets with parking on both sides of the street. There is now a younger and more mobile population within these areas, which has resulted in an increase in car ownership levels.
	Existing parking permit system	Medium	0	Over the past 10 years there has been a programme of designating these residential areas as Controlled Parking Zones (CPZs), with certain parking restrictions linked to a permit system. There are parts of the CPZs where parking demand considerably outstrips supply. The measure offered a way to resolve this problem without going as far as limiting the number of permits in circulation. Permit charges were revised to favour smaller and alternative fuel cars. This measure may be particularly suited to implementation in other cities experiencing parking problems and/or which already have a parking control system in place, which could be adapted to favour more environmentally friendly cars.
Stakeholders' Involvement				
	Public and political approval	High	0	Local political approval was required to consult the public on introducing a revised parking permit tariff and to implement this. There was relatively good public support for the measure. See also 'Wider Issues'. Successful implementation of this measure elsewhere is also likely to depend in part on local political and public endorsement. This links to scheme design, i.e. setting the criteria for and level of charges so that they are likely to be acceptable to the public. (See 'Implementation')

Components relevant to transferability of measure 7.2	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Technical Requirements				
	IT issues	Medium	0	Implementation of the new permit system was hampered by various IT issues. For instance it would have been ideal to purchase a bespoke software package from an external supplier to support implementation. However, this would have involved signing a 10 year contract which Norwich City Council was unable to commit to. Therefore the software had to be rewritten in-house. It is hard to assess implications in terms of transferability as it will depend on arrangements for provision of IT support in other cities.
Implementation				
	Criteria for new permit system	High	1	Considerable effort was devoted to devising appropriate criteria. This helped to secure political and public support for the new permit scheme. Various options were explored including charging by vehicle emissions rating, fuel type, engine size and length. The pros and cons of the different approaches were examined. The level of and differential between charges was carefully considered. Other cities looking at implementation are advised to take a similarly thorough approach to scheme design and they may particularly benefit from consulting Norwich measure staff on this.
Wider Issues				
	Increase in fuel prices and public understanding of climate change	Medium	1	The measure leader has noted that these factors contributed to public acceptance of the measure. They may well have a bearing on public attitudes towards the measure if taken forward in other cities.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 10 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	3,780	0	0	-3,780	-3,780
Year 2	6,850	0	0	-6,850	-10,630
Year 3	10,400	0	0	-10,400	-21,030
Year 4	44,000	0	0	-44,000	-65,030
Year 5	0	0	0	0	-65,030
Year 6	0	0	0	0	-65,030
Year 7	0	0	0	0	-65,030
Year 8	0	0	0	0	-65,030
Year 9	0	0	0	0	-65,030
Year 10	0	0	0	0	-65,030
Total	65030	0	0	-65,030	
NPV	57770	0	0	-57770	
Average net present annual cost				-5777	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	82371	0	0	-82371
NPV	73175	0	0	-73175
Average net present annual cost				-7318

The impact of measure 7.2 will be felt over an extended period of time, depending upon how strongly the differential cost of parking is perceived by the residents who are applying for parking permits. The overall impact will also depend on whether the move to shorter vehicles frees up roadspace that allows residents to purchase more, smaller vehicles for which demand is currently suppressed by the lack of available parking.

In order to quantify these elements, scenarios have been modelled, as laid out in the full measure evaluation template, which suggest a long term overall impact of between 303 and 2742 tonnes CO_2 per annum.

Assuming a linear progression to reach these values after 10 years, the average reduction range would be 156.5 - 1371 tonnes CO_2 per annum.

Converting to cost per tonne values, this gives a range of £4.2 - £36.9 per tonne of CO_2, or €5.3 - €46.8 per tonne of CO_2 using the same purchasing power parity factor as applied to the other measures.

3.2.5 Measure 8.4: Rail Station Interchange

Norwich railway station is located over 1 km from the commercial and retail centre of the city. The lack of easy access from the station to connecting bus services was seen as a deterrent to the use of local rail services for travel to work, shopping and leisure activities.

Public consultation carried out by Norwich City Council and Norfolk County Council on transport issues within the city centre had consistently demonstrated the public's desire for better linkage between the railway station and the city centre, and for opportunities for bus interchange to be made clearer.

The measure sought to address the current inadequacy of services, facilities and information provision for transfer passengers between rail and bus at this key interchange node in the city's public transport network. Its implementation would ensure easy access to frequent connecting bus services, thus reducing a barrier to the increased use of heavy rail for local journeys into Norwich.

The measure has been implemented by working in partnership with railway industry stakeholders to:

- Redesign the space outside the railway station to improve the location of the bus stop on the station forecourt
- Improve the access arrangements for buses stopping on the adjacent highway so that these stops could be located closer to that within the railway station forecourt
- Provide high quality waiting facilities and real-time passenger information on the station forecourt with convenient pedestrian links between the station building, the waiting facility and the bus stops on the forecourt and the adjacent highway

The existing bus stops at the railway station have been moved together, making it easy to catch any bus to the city centre whether it runs from the station forecourt or passes the station on Thorpe Road. Prior to the measure passengers were unsure where to wait for the next bus service to the city centre and there was a possibility of them missing a bus due to waiting at the wrong stop. The alteration to the bus stops has involved the relocation of part of the existing taxi rank. A new bus stop lay-by has been built on the south side of Thorpe Road and a large sheltered and well-lit waiting area provided between the bus stops on the station forecourt and Thorpe Road. Within the waiting area there is seating for 15 people plus a dedicated wheelchair space, a ticket vending machine for pre-purchase of bus tickets and an electronic sign displaying real-time information on bus arrival and departure times. There is a raised boarding area at each bus stop allowing wheelchair users to board low-floor buses without a ramp. A new cycle shelter with 20 covered 'Sheffield' cycle stands has been installed in the existing cycle parking area on the station forecourt.

Key Results

The actual frequency of bus services from the rail station to Norwich city centre increased after completion of the interchange. 7 additional services now operate from the interchange, adding approximately 80 extra departures per day. Passenger journeys to and from the rail station increased following creation of the interchange; for example in relation to the most frequent service between the station and the city centre (number 25):

- passenger boardings at the station increased by 9%
- the number of passengers alighting at the station increased by 19%.

A survey of 400 people was conducted outside the rail station in October 2007. The key results from this were as follows:

- There was good awareness of the measure. 48% were aware of the works carried out outside the station to create an interchange and their purpose.

- There was a very high level of satisfaction with the measure. 98% were either very or quite satisfied with the quality of the interchange facilities.
- The measure improved perceptions of public transport accessibility and security. 80% thought that physical access to the bus stops on the station forecourt and nearby area was much or slightly better once the interchange had been completed. 68% felt much or slightly safer when using the interchange than they did prior to its implementation.
- Perceptions about the frequency of bus services from the rail station to the city centre were enhanced. 34% thought that the frequency of these bus services had improved following measure implementation.
- The frequency of usage of bus services from the rail station to the city centre increased. The proportion of those travelling at least once a week increased by 24%, and the proportion travelling at least five days a week increased by 12%, demonstrating a shift towards more frequent bus travel.

Recommendations

With a high level of positive passenger feedback, increased frequency of journeys and passenger growth, this measure proved extremely successful. It is highly recommended for replication in other cities, in locations with a significant level of interchange activity but lacking a focal point for interchange, and/or with poor physical connectivity between individual stops in an interchange cluster.

Whilst some of the challenges faced and solutions adopted within this measure reflect site specific characteristics and local circumstances, there is considerable scope to apply the wider principles of the measure to other cities. Specific recommendations that may be transferable are as follows:

- Recommendation 1 - Making use of local knowledge of the public transport network will help to identify bus stops, or clusters of stops, that have potential to cause confusion to passengers. The focus of an initial search for suitable sites should be multiple stops with no clearly defined waiting area, and waiting facilities with only partial vision of bus stops, particularly those used by visitors who may be unfamiliar with the local public transport network.
- Recommendation 2 - Early discussions with transport operators and infrastructure owners will be extremely useful in identifying suitable sites and collating baseline data. Their involvement from the outset will also help to develop an open and positive exchange about the delivery of the measure and is likely to lead to greater support throughout the process. Regular briefings for senior stakeholder representatives may assist in expediting formal measure approval from key stakeholders, by ensuring that measure delivery becomes a shared priority.
- Recommendation 3 - The development of proposals for public transport interchange facilities in a historic city will benefit from early consultation with heritage bodies, and local planning and conservation officers, particularly where historic buildings and landmarks are affected.
- Recommendation 4 - Public engagement and consultation should play a key role in developing the design of a public transport interchange scheme. This can yield valuable information to inform the design process. Appropriate methods may include public exhibitions and the use of face to face interviews or self-completion questionnaires.
- Recommendation 5 - Several aspects of the measure have generated a significant number of favourable comments from users. These should be recognised as good practice for adoption in future planning and development of small to medium sized public transport interchange schemes. These include:

- An appropriate level of lighting in and around the interchange waiting area and cycle parking facilities. This contributes to user perceptions of safety and security.
- The provision of a sheltered waiting area of sufficient size to accommodate all waiting passengers, with a design segregating the waiting area from traffic
- A shelter that is sufficiently enclosed to provide protection from the elements, but sufficiently open to contribute to positive perceptions of security and clear lines of sight to stops.

Transferability

There appears to be reasonably good scope for transferring this measure elsewhere. Geographical factors and existing linkages between transport modes/hubs will be important when considering transferability, as noted under 'Recommendations'. Other considerations which may be important when transferring the measure elsewhere are: early identification of and engagement with key stakeholders, users and interest groups; where significant financial investment is planned, a need for robust financial management including identification of contingency funds; having high quality staff who can devote time to project management, troubleshooting and stakeholder engagement.

Components relevant to transferability of measure 8.4	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Strategies and policies				
	Public transport policy	Medium	1	The measure was taken forward as an element of a wider scheme to improve public transport interchange facilities in Norwich city centre. This helped drive the measure. Implementation in other cities could be aided if the measure is part of a wider strategy. However whilst this was a driver in Norwich, there may be challenges associated with belonging to a wider strategy; e.g. co-ordination with other strategy elements, more stakeholders to liaise with, overall quality of strategy (see also Human resources/management - Key staff).
Geographical area covered				
	City Centre	High	2	The bus interchange is at Norwich rail station, which is over 1km from the commercial and retail centre of the city. Public consultation had demonstrated the need for better linkage between the station and city centre, which should encourage increased use of local rail services. Hence this measure could be transferred to other cities whose major rail stations are some distance from the centre. However, there may be other reasons why cities could benefit from interchanges (including those with more centrally located stations); e.g. in Norwich public consultation suggested creation of a formal interchange could also improve facilities for/information provision about changing between rail and bus.
Finances				
	Capital costs	High	0	The project involved construction of an interchange. Funding included a contingency element and financial estimates were regularly reviewed against the budget. This meant changes to the original design (required to satisfy planning conditions) could be accommodated within the budget. Implementation in other cities may also require significant capital investment for construction, so careful financial management and contingency planning are recommended.
	Running Costs	High	0	Interchange maintenance costs were not budgeted for originally. This was eventually resolved by obtaining funding from rail operators. Transferability to

Components relevant to transferability of measure 8.4	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				other cities will be influenced by whether due consideration is given to how running costs will be supported.
Human resources / management				
	Key Staff	High	0	There were certain staff who played a key management role in ensuring successful measure implementation: a) Project Board for overall scheme to enhance interchange facilities in Norwich city centre (see also Strategies and Policies - Public transport policy) b) measure leader constantly encouraged rail stakeholders to get through approval process required by station landlord c) site agent for contractor constructing interchange troubleshooted subcontractor problems. Transferability to other cities would be helped by having good quality, committed managers in place to drive forward the measure and tackle issues encountered in implementation..
Stakeholders involvement				
	Operators involved and businesses affected	Low – conflicting interests High – crucial stakeholder	0	In Norwich it was not possible to achieve the original objective of increasing the space available for buses in the rail station forecourt. It would have resulted in loss of income from reduction in forecourt parking spaces, unacceptable to station operator. It is particularly difficult to predict how this could affect transferability since it depends on the ownership of different interests at potential interchange sites in other cities and whether revenue generating activities exist which would be adversely affected by an interchange. The main issue seems to be to consider early on whether there are conflicting interests and whether/how these can be addressed. There were many stakeholders in this measure, but the key one was the station landlord. As it had to approve the interchange development, refusal or delay in doing so could have jeopardised the measure. There were delays which had to be addressed, through regular communication with the stakeholder. Assessing transferability in relation to this factor depends on the ownership of different interests at potential interchange sites in other cities and the scale of the

Components relevant to transferability of measure 8.4	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				proposals. For example if a site was owned by the organisation responsible for the measure, this should facilitate implementation. It would be important at the outset to identify and engage with any stakeholders who are crucial to the project's success.
	Users and interest groups	High		Engagement took place with a number of transport-related interest groups and members of the public during measure planning and implementation. They played a key role in informing the interchange development. For similar measures in other cities, relevant users and interest groups should be identified and actively engaged with.
	Planning	High	1	With this measure involving construction development, a number of planning conditions had to be satisfied, e.g. relating to listed building consent and tree preservation. Considerable effort needed to be devoted to early consultation and ongoing communication with those responsible for planning decisions. Relevance to transferability would be influenced by scale of proposed developments in other cities, site specific factors and existence/stringency of local planning requirements. The key considerations would be whether/what planning regulations exist that could impact on the measure, and to engage with planners as necessary at an early stage.
Implementation				
	Good Practice	Medium	2	The measure leader identified aspects of good practice for adoption in the future planning and development of small to medium sized public transport interchange schemes: • ensuring a good level of lighting in and around the interchange waiting area and cycle parking facilities, which contributes to user perceptions of safety and security • provision of a sheltered waiting area of sufficient size to accommodate all waiting passengers with a design allowing segregation from traffic • designing a shelter so it is sufficiently enclosed to provide protection from the elements, but sufficiently open to contribute to positive perceptions of security and clear lines of sight to transport stops.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration:	20 years				
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	12,717	0	0	-12,717	-12,717
Year 2	85,728	0	0	-85,728	-98,445
Year 3	379,078	0	0	-379,078	-477,523
Year 4	91,495	17,015	0	-108,510	-586,033
Year 5	-13,394	200	0	13,194	-572,839
Year 6	0	200	0	-200	-573,039
Year 7	0	200	0	-200	-573,239
Year 8	0	200	0	-200	-573,439
Year 9	0	200	0	-200	-573,639
Year 10	0	200	0	-200	-573,839
Year 11	0	200	0	-200	-574,039
Year 12	0	200	0	-200	-574,239
Year 13	0	200	0	-200	-574,439
Year 14	0	200	0	-200	-574,639
Year 15	0	200	0	-200	-574,839
Year 16	0	200	0	-200	-575,039
Year 17	0	200	0	-200	-575,239
Year 18	0	200	0	-200	-575,439
Year 19	0	200	0	-200	-575,639
Year 20	0	200	0	-200	-575,839
Total	555623.9	20215	0	-575,839	
NPV	502677	16935	0	-519612	
Average net present annual cost				-25981	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	703785	25605	0	-729390
NPV	636719	21451	0	-658170
Average net present annual cost				-32909

The indicators chosen and monitored for measure 8.4 (focusing on awareness, service patronage and mode split) have not been converted into emissions and so are not included in this cost effectiveness evaluation.

3.2.6 Measure 8.5: On Street Ticket Vending Machines

15 on street ticket vending machines (TVMs) were installed at selected locations in Norwich, including the central bus and rail stations, other parts of the city centre, the University of East Anglia (UEA), and the Norfolk and Norwich University Hospital with the aim of delivering:

- Journey time and wait time savings for public transport users
- Improved efficiency and reliability of bus services, contributing to increased bus patronage and Local Transport Plan targets
- Potential for additional revenue and operating cost savings for bus operators
- Increased capacity of on-street stops to accommodate additional departures
- System capable of future upgrade to support smart card ticketing

Key Results

The key results were as follows:

- An increasing number of people used the machines, shown through increases in revenue and ticket sales. There was a 15% increase in monthly ticket sales from January to December 07. Since the machines were installed, over 100,000 tickets have been sold, which equates to over £270k in revenue.
- Awareness of the machines greatly exceeded the use of the machines and the reasons for this need to be fully understood, as explored below. Despite 52% of people interviewed at the hospital being aware of the machines, only 8% of these people had actually used the machine. (Note this was a sample of the general public and not specifically bus users.)
- There were large variations in usage of the machines across different sites. The most popular machines sold an average of around 1,000 tickets per month, whilst the least popular machines only sold around 50 – 100 tickets per month. Machines at the bus station and UEA sold considerably more tickets than machines located elsewhere. This is consistent with these areas having high bus loadings and being key transport interchanges. Siting of machines is therefore important when considering any future installations.
- Usage of the machines was significantly influenced by ticket promotions / developments of individual bus operators. An example of this was at UEA where significant numbers of tickets were sold via the TVM. However, the introduction of a new ticket for students by the main bus operators, only available from the Students Union, meant a significant reduction in use of the TVM. The number of tickets sold from the machine reduced from an average of 1,000 tickets per month to around 500 tickets per month.
- It is important to ensure that the service and maintenance of the machines is carried out by a competent authority. The complexity of the machines was not fully understood initially and the scheme benefited by engaging a new contractor later on with a wider skills base. Prior to the new contractor being appointed, the availability of the machines was around 75-80%, i.e. up to 20% of machines were out of service at any one time. After the new contractor was appointed, the availability was consistently 95-100%, a significant improvement.
- The TVMs needed to be more visible on the street for use to be made of them. Usage increased significantly once new, large and highly visible vinyl signs were applied to the sides. Monthly ticket sales increased from an average of around 2,200 tickets prior to new vinyls being added to around 2,600 after the vinyls were added.

- External factors played a significant part in influencing the effectiveness of this measure. Other elements, such as bus priority, bus shelters, passenger information, changes to bus routes and timetables, and concessionary fares all had a bearing on people’s travel patterns and behaviour.

Recommendations

Overall, implementation of a similar type of technology in other cities is recommended. This would need to be delivered as part of an overall commitment to provide off-bus ticketing in partnership with bus operators. These machines raise the profile of public transport and are an important element in making the travel by sustainable modes easier and more attractive.

- Recommendation 1 – There should be early involvement of bus operators in the planning phase. This should include a clear understanding that fare chart information will need to be made available in a timely manner, and agreement as to the design of ticketing and paper formats.
- Recommendation 2 – The service and maintenance contractor used should be one that has a wide skills base including software as well as engineering capabilities.
- Recommendation 3 – Careful attention should be paid to the siting of TVMs to ensure maximum visibility and use. Where possible, machines should be located as close as possible to main boarding points and not so they are equally spaced between boarding points.
- Recommendation 4 – Machines should be made as visible as possible so they are distinctive and there is no uncertainty as to what they are for.
- Recommendation 5 – TVMs should offer tickets from as many operators as possible with as many different ticket options as possible.
- Recommendation 6 – Ensure procedures are in place for convenient updates to fares on the machines. Despite best efforts, little advance warning may be provided if fares changes and it should be possible to amend fares with as little warning as possible.

Transferability

There appears to be good scope for transferring this measure elsewhere and the Norwich project team recommends delivery in other cities.

Key factors to consider when transferring the measure elsewhere are: building relationships with bus operators at an early stage, since changes in their activities will impact on TVM usage; making appropriate provision for servicing and maintenance of machines; and ensuring optimum location and visibility of machines.

Components relevant to transferability of measure 8.5	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Strategies and policies				
	Public transport policy	Medium	1	The measure was taken forward as an element of a wider scheme to improve public transport interchange facilities in Norwich city centre. This helped drive the measure. Implementation in other cities could be aided if the measure is part of a wider strategy. However whilst this was a driver in Norwich, there may be challenges associated with belonging to a wider strategy; e.g. co-ordination with other strategy elements, more stakeholders to liaise with, overall quality of strategy.
Baseline Situation				
	Congestion/Existing ticket system	High	2	Increasing congestion in Norwich was also identified as a driver for implementing this measure. This was linked to the fact that before measure implementation single/return bus tickets were only available from drivers. As a result there were lengthy waiting times at bus stops and delays to bus journeys. This measure could be particularly useful to implement in cities which have similar bus ticket systems to that applicable in Norwich prior to TVM installation.
Stakeholders' involvement				
	Operators involved	High	1	Usage of TVMs in Norwich is significantly affected by developments instigated by individual bus operators, e.g. ticket promotions and changes in fares. Therefore in terms of transferability, an important factor to consider in other cities would be how bus services are owned, the number of bus operators and how their activities might affect TVMs usage. Early engagement with bus operators is recommended.
Technical Requirements				
	Functionality, reliability and maintenance of TVMs	High	1	Various problems were experienced with the functionality and reliability of machines, at the set up stage and subsequently. Software faults were particularly hard to diagnose. Initially it had been envisaged that maintenance would be not be significant and could be handled by Norfolk County Council. As this was more demanding than anticipated, it was contracted to an external company.

Components relevant to transferability of measure 8.5	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				Other cities considering implementation of this measure could particularly benefit from the Norwich experience of dealing with technical issues. This could include advice on the functionality that can be achieved, what problems could occur and how these might be prevented or addressed, the likely level of maintenance needed and what technical skills are required to provide this maintenance.
Implementation				
	Location and visibility of TVMs	High	2	It was found that TVM usage was also influenced by their location and visibility. Usage increased significantly when large and highly visible notices were put on the machines. It is also recommended that machines should be located as close as possible to main boarding points.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration:	10 years				
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	64,423	109,983	1,500	-172,906	-172,906
Year 2	160,588	22,632	1,575	-181,645	-354,551
Year 3	5,970	24,466	1,654	-28,782	-383,333
Year 4	0	7,000	1,736	-5,264	-388,597
Year 5	0	7,000	1,823	-5,177	-393,774
Year 6	0	7,000	1,914	-5,086	-398,859
Year 7	0	7,000	2,010	-4,990	-403,849
Year 8	0	7,000	2,111	-4,889	-408,738
Year 9	0	7,000	2,216	-4,784	-413,522
Year 10	0	7,000	2,327	-4,673	-418,195
Total	230981	206081	18866.84	-418,195	
NPV	217540	188063	15475	-390127	
Average net present annual cost				-39013	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	292574	261034	23898	-529710
NPV	275548	238211	19602	-494157
Average net present annual cost				-49416

The indicators chosen and monitored for measure 8.5 (focusing on awareness, service patronage and mode split) have not been converted into emissions and so are not included in this cost effectiveness evaluation.

3.2.7 Measure 8.6: Linking Individual Passenger Transport Information with Healthcare Appointments

Health related transport is currently provided by several different agencies such as the Health Sector, Social Services and Voluntary sector, all operating independently of each other. Information regarding these services and others, such as the more conventional bus and community transport journeys, tends to be fragmented. All too often when the public's perceived need for transport is investigated, transport services are found to be in place already. Public unawareness of transport options and problems in accessing this information supports this perception.

This project explored the potential of collating all relevant information about transport options and presenting it in a customer friendly format on any necessary documentation i.e. as part of the hospital appointment letter. Unfortunately it was not possible to deliver most planned elements of the measure, largely due to the withdrawal of the main partner, the Norfolk and Norwich University Hospital for reasons related to institutional priorities unrelated to CIVITAS. Instead, efforts were made to improve public transport information at the hospital. New posters and leaflets were designed, and a radio advert campaign was launched. Feedback is being sought on these from patients and staff, but the results are not expected until after the end of the SMILE reporting deadlines.

Key Results

There is little that can be evaluated from this measure since it was not possible to implement it as intended. The lessons learnt provided a more meaningful assessment, and shaped the following recommendations and transferability assessment.

Recommendations

Despite the measure not being delivered in Norwich, it is the view of the project team that it should be recommended for delivery in other cities. The potential benefits of successful implementation are significant, including increased use of public transport to access health care and a decreased number of missed health care appointments. Taking account of lessons learnt in Norwich, specific recommendations are as follows:

- Recommendation 1 – A wide range of partners should be engaged at the outset. Should there be difficulties with one partner, it should be possible to continue to develop the project with other partners at the earliest opportunity.
- Recommendation 2 – Topics of finance and resource requirements should be considered at the outset to ensure all parties are clear as to what involvement and commitment is needed throughout the project delivery period.

Transferability

Assessment of transferability has been limited, as it was not possible to implement the measure as originally proposed. However there are still some lessons which other cities should take account of. If they can build successful partnerships with health care stakeholders there may be scope for transferring the measure elsewhere in its originally intended form. There may also be scope for taking forward similar schemes with other relevant organisations, e.g. educational establishments.

Components relevant to transferability of measure 8.6	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Finances				
	Set up and running costs	High	0	The main partner in this project pulled out partly due to financial reasons. This reduced funding available for the measure which contributed to significant deviations from the original plans. (See also 'Stakeholder involvement'.) Other cities contemplating this measure will need to consider how set up and running costs would be funded.
Stakeholders' involvement				
	Key partner	High	0	When the key partner, Norfolk and Norwich University Hospital (NNUH). withdrew it was not possible to identify alternative partners. The size and complexity of the NNUH meant it was not possible to make decisions swiftly regarding its involvement in the project. Delays in reaching a conclusion limited time available for seeking alternative partners.. The original aim of the measure was to adopt an integrated approach to provision of improved transport information to health care users. This would supply patients with tailored transport information when attending specific appointments. Other cities considering implementation of this measure should look at making a business case to proposed partners, for example referring to efficiency savings that could be obtained through fewer missed health care appointments or late show up by patients, and how parking problems experienced by health care providers could be eased. The NNUH has retained some interest in working with measure staff - a) to identify areas where more public transport information needs to be offered to health care users and b) to provide improved transport information to health care users overall. If other cities are unable to achieve an integrated approach to provision of transport information to health care users, they may be able to adopt more limited but nevertheless useful measures, as happening in Norwich.
Technical Requirements				
	Use of new technology	Medium	1	New technology would have had to be developed and implemented to allow generation of passenger transport options at the time of sending out appointment

Components relevant to transferability of measure 8.6	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				letters. Technical considerations are likely to be important for other cities interested in this measure

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 3 years					
Year	Expenses: Set-up Costs (Fixed Cost)	Expenses: Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	0	3,728	0	-3,728	-3,728
Year 2	0	3,997	0	-3,997	-7,725
Year 3	0	2,337	0	-2,337	-10,062
Total	0	10062	0	-10,062	
NPV	0	9441	0	-9441	
Average net present annual cost				-3147	

Adjusted to Euros, allowing for purchasing parity conversions					
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	
Total	0	12745	0	-12745	
NPV	0	11959	0	-11959	
Average net present annual cost				-3986	

Implementation of this measure highlighted many problems about forming partnerships with strategic partners in the UK health sector in order to deliver a direct travel advice service to patients and visitors to the main hospital in Norwich. The impacts of the measure have not been felt directly during the SMILE, although progress has been made late in the project period regarding provision of new public transport information facilities at the hospital.

3.2.8 Measure 9.2: Development of a Car Sharing Club

This measure introduced a car sharing club to Norwich operating from two locations:

- • a campus based, academic institution, University of East Anglia (UEA). Eventually this was withdrawn due to poor levels of usage for various reasons (see ‘Transferability’).
- • a Controlled Parking Zone (CPZ) near the city centre (referred to as the ‘Norwich city club’ subsequently). Here revised parking permit charges were introduced based on vehicle length, to encourage the use of smaller, more environmentally friendly vehicles.

City Car Club (SmartMoves) was engaged to operate both the UEA and Norwich city clubs. This company provides car clubs nationally within the UK. Five diesel cars were used in the Norwich city club in 2007, with a combined fuel consumption of 4.5 litres per 100km travelled. They have a fuel economy rating of B.

Awareness surveys were carried out in May 2007, approximately one year after the Norwich city club had been launched; there were 808 respondents. Follow up surveys were carried out in summer 2008; there were 805 respondents. On a national basis, each new City Car Club member is sent a survey asking about travel modes and car ownership on joining, and then all members are asked to participate in an annual survey. Comparing the two surveys gave a snapshot on how the Norwich city club was changing travel patterns.

Key Results

The key results were as follows:

- From a zero level in 2005/6, public awareness of the club grew to 23% by May 2007 within the survey area (the Norwich urban area, and its rural hinterland)
- By summer 2008, just over one quarter of people surveyed said that they had heard of the city car club although this rose to 31.3% for city residents.
- In both the 2007 and 2008 awareness surveys, the most frequently cited source for hearing about the club was newspapers, by nearly half of those who were aware of the club.
- As of June 2008 the Norwich city club had 140 members.
- 26% of Norwich city club members give up a private car and 48% of Norwich city club members decided not to buy a car. The total number of cars displaced as of summer 2008 was equal to 40 cars. 79% of cars given up were five years old or more. These were replaced with new low emission diesel cars.
- Amongst Norwich city club members there was a 17% reduction in short journeys by car, a 12% increase in cycling and a 9% increase in walking.
- The CO_2 emitted from club cars ranged from 119g/km to 145g/km, on average 127g/km. This average is well below the 2008 target of 140g/km agreed between European Automobile Manufacturers Association (ACEA) and the EU in 1997.

Recommendations

- Recommendation 1 – General awareness and support is critical to the success of a car sharing club, both in initial establishment, and in terms of growth. Word of mouth is the single most effective mechanism for achieving a successful club.
- Recommendation 2 – Implementation would be possible in other cities of a similar size to Norwich, provided that the scheme received financial support in the earlier stages.
- Recommendation 3 – Launching a club in an institution of higher education will be more successful if as many stakeholders as possible are eligible to join. City Car Club’s insurance criteria excluded all undergraduates at UEA. There are now more favourable insurance criteria, which can include 19 to 21 year olds. This greatly magnifies the potential for interest in the club.
- Recommendation 4 – Engaging businesses at the earliest opportunity is essential, to increase membership, utilisation of the cars and awareness of the service. Businesses generally use club cars during the working day, whereas residents tend to use the cars during evenings and weekends. This daily business usage can be crucial to the overall sustainability of car clubs.
- Recommendation 5 – In compact cities, car club operators should be aware that they may need to achieve higher membership levels per vehicle than is ‘standard’ in the industry, and the density of vehicle provision needs to be adjusted accordingly.

Transferability

There appears to be reasonably good scope for transferring this measure elsewhere. When transferring the measure elsewhere planning is required to ensure that car clubs are viable, sustainable enterprises. This should include consideration of who will manage the clubs, target markets and arrangements for publicity.

Components relevant to transferability of measure 9.2	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Links to other initiatives	Medium	1	The measure is related to various other SMILE measures in Norwich: • the car sharing club operates from within a Controlled Parking Zone (CPZ) near the city centre. Here revised parking permit charges have been introduced based on vehicle length, to encourage the use of smaller, more environmentally friendly vehicles • there is potential to exploit positive experiences of those using car pooling for work to encourage subsequent membership of car clubs • car clubs could be promoted through provision of individual travel advice. Other cities considering introducing car clubs may find that they benefit from links to other sustainable transport initiatives like those in Norwich. (See also 'Awareness and communication'.)
Target Population				
	Areas covered by car clubs	Medium	1	In addition to operating from the CPZ, a car club was introduced at the University of East Anglia. Eventually this was withdrawn due to poor levels of usage for various reasons. These included ineligibility of undergraduates for club membership, since there was an age limit on the club's insurance policy that excluded them. So this removed a potentially large market. Other cities interested in this measure will need to consider characteristics of the target market and how these relate to the features of the scheme.
Stakeholders' involvement				
	Business partner	High	0	An existing company, Car Clubs (SmartMoves), was established as the operator of and a partner in the scheme. This should contribute to ensuring the long term sustainability of the measure (see also 'Organisational aspects'). Other cities contemplating this measure should explore whether and what partnerships can be established to help make car clubs viable businesses.

Components relevant to transferability of measure 9.2	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Organisational Aspects				
	Critical mass	High	0	The club must become self sustaining after SMILE start up funding, by achieving a critical mass of around 20 vehicles. Other cities considering this measure will need to develop a business plan for achieving critical mass.
Implementation				
	Fuel used in cars	Low	1	The club uses diesel cars. It was originally thought that the diesel cars may be appropriate to integrate with ongoing work on use of biofuels in vehicles in Norwich. The sustainability of larger scale biofuel production was questioned by club members and local politicians. It is now intended to replace the diesel fleet gradually with petrol and hybrid cars. Other cities contemplating this measure may wish to consider what fuel(s) will be used for club cars.
Awareness and Communications				
		High	1	The measure leader highlighted the importance of both member and non-members being aware of car club benefits. Promotion needs to be undertaken with members of the public, workplaces and developers. Other cities looking at implementing this measure should consider arrangements for initial and ongoing publicity to target markets.
Wider Issues				
	Public concerns	Medium	1	Public concerns about fuel price increases, climate change, congestion and parking problems helped drive the measure. Such concerns may well exist in other cities.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 5 years					
Year	Expenses: Set-up Costs (Fixed Cost)	Expenses: Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	0	1,700	0	-1,700	-1,700
Year 2	3,600	10,298	526	-13,372	-15,072
Year 3	0	61,805	14,755	-47,050	-62,122
Year 4	3,600	44,661	15,062	-33,199	-95,321
Year 5	0	43,000	15,100	-27,900	-123,221
Total	7200	161463.68	45442.79	-123,221	
NPV	6498	142124	41026	-108984	
Average net present annual cost				-21797	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	9120	204519	57560	-156079
NPV	8231	180023	51966	-138045
Average net present annual cost				-27609

The impacts of the car club on emissions are dependent upon two factors – the change in travel patterns that results from car club membership and the fact that the car club cars are significantly more energy efficient, and hence lower emitters of CO_2, than the average for new cars in the UK.

The results in terms of travel patterns are similar in magnitude to those measured and assessed in many personal travel planning projects in the UK and elsewhere, with increases in bus use, walking and cycling for short trips. This scale of impact of the personal travel planning projects has been estimated to reduce CO_2 emissions per head by around 0.2 tonnes per person per year.

The majority of CO_2 emissions from travel for a typical UK resident are the result of car use, and so the use of low emission cars will also have an impact on this figure. Given that the cars used are around 20% more fuel efficient than the UK average, then this will contribute up to 0.4 tonnes per person per year.

The car club had established around 200 members by the end of the SMILE project, and applying these factors it seems appropriate to apply an approximate saving of 120 tonnes CO_2 reduction per annum as a result of the car club.

Converting to cost per tonne values, this gives approximate values of £182 per tonne of CO_2, or €230 per tonne of CO_2 using the same purchasing power parity factor as applied to the other measures.

3.2.9 Measure 10.3: Development of Strategic Freight Holders Club to Deliver Improved Efficiency of Freight Operation in the City Area and Effect Improved Air Quality in Urban Areas

The freight stakeholder group was established to bring together organisations that could work together to develop a strategic freight initiative in the Norwich urban area and through which demonstration projects based on clean goods vehicles will be implemented.

Initially the offer was made for face to face meetings, but was subsequently changed to an on-line forum following low attendance among target audience. The freight stakeholder group now consists of a forum for consultation on issues that will affect the freight transport industry.

Key Results

The key results were as follows:

- Some representatives, although interested in the concept, did not want to commit to regular meetings. Instead the stakeholders club was used to promote other local SMILE measures, particularly the freight consolidation centre, 10.5, and also 10.4. The club was also used as a consultation forum.
- Following on from the establishment of the freight stakeholders club there has only been limited participation to the measures from stakeholders.

Recommendations

- Recommendation 1 – A more effective research and development phase to engagement, starting with the trade organisations that are paid to represent individual members would be appropriate to set an agenda of mutual interest. This would allow an understanding of the day-to-day interests of the freight industry and how these can be addressed in conjunction with the more strategic aspirations of the public authorities.
- Recommendation 2 – If it is not possible to operate a strategic freight stakeholders club with regular meetings, alternative uses for the club could be sought and implemented, as happened in Norwich. These could include participation in consultations, and providing an input into future transport policies and strategies.

Transferability

There appears to be reasonable scope for transferring this measure elsewhere. A freight stakeholders club may operate most effectively if incentives to join are provided, which are linked to other sustainable freight measures. Even if in other cities it is not possible to establish a club which proactively addresses freight issues, it could operate as a forum for consultation and promotion of sustainable freight initiatives as has happened in Norwich.

Components relevant to transferability of measure 10.3	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Services Offered				
	Consultation and promotion of freight specific initiatives	High	0	The freight stakeholder club was introduced by Norfolk County Council as a way to engage with freight operators about relevant forthcoming schemes. The decision was taken to run it as an internet-based forum because of the perceived difficulty in keeping freight operators engaged with other freight quality partnerships in the UK – this was considered to be due to the time commitment involved. However, the current arrangement appears to favour a one-way information flow, from public sector partners to the freight operators and does not adequately allow the freight operators to highlight the issues that are important to them. This risks lack of engagement for a different reason – that of the agenda being skewed towards that of the local authority and what it perceives as the key issues, so losing the opportunity for bargain and compromise that a more interactive, face to face forum would offer. Establishment of a face-to-face forum would provide the opportunity for discussions with the trade organisations which represent the local operators and also allow the opportunity to bring in wider representation from other valid participants, such as businesses and their representatives who are the people who generate the freight transport through buying and selling the goods that need to be transported.
Stakeholders' Involvement				
	Club members	High	0	Stakeholder involvement is the essence of this measure. The original measure objective was to establish a freight stakeholders club to take a strategic and collective approach to developing and implementing sustainable freight initiatives in the Norwich area. For example it was envisaged the club could be used to determine delivery and collection needs, and whether any of these could be combined. The club has not operated with regular meetings as originally intended, since it proved difficult to arrange meetings and secure time commitment from freight operators. However the club is being used to promote related SMILE

Components relevant to transferability of measure 10.3	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				measures and as a consultation forum. Lack of time and finding suitable meeting dates could well be problems experienced by other cities taking forward this measure. Other factors relevant to transferability may include: the number of freight operators in the area and existence (or perception) of operators' needs which could be addressed by strategic, collaborative action.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 4 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	15,000	0	0	-15,000	-15,000
Year 2	0	0	0	0	-15,000
Year 3	0	0	0	0	-15,000
Year 4	0	0	0	0	-15,000
Total	15000	0	0	-15,000	
NPV	14493	0	0	-14493	
Average net present annual cost				-3623	

Adjusted to Euros, allowing for purchasing parity conversions					
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	
Total	19000	0	0	-19000	
NPV	18357	0	0	-18357	
Average net present annual cost				-4589	

The impact of the freight stakeholders club is, as the name suggests, intended to be as a support mechanism for improved partnership with the freight industry and as such is not appropriate for cost effectiveness evaluation.

3.2.10 Measure 10.4: Priority Access for Clean Goods Vehicles

This measure was originally set up to examine whether access to priority measures (such as bus lanes) could be provided for those freight vehicles that adopt biofuels or cleaner fuelled vehicles. Feasibility work into this proposal identified a number of issues.

- Difficulty identifying those vehicles that meet the emission standards and those that do not. The age of the vehicle, identifiable through its registration number, is a guide to the emission standard of a vehicle but is not the definitive answer because older vehicles may have been retrofitted with pollution reducing equipment or be using biofuels. The fact that there is no external indication of whether a goods vehicle is permitted to use a bus lane would make enforcement by the police difficult.
- New vehicles automatically meet the current Euro standard, and most freight operators have an on-going programme of vehicle renewal. Therefore a point would be reached where all goods vehicles would be eligible to use the bus lane unless the Traffic Regulation Order was continually

amended to reflect the latest emission standard. This would be dependant on new emission standards being set on a regular basis.

- Concerns about a large number of HGVs mixing with cyclists within the bus lane.
- Lack of balance between the high investment cost for clean vehicle technology specifically for the unclear benefits of the scheme in the eyes of the freight operators meant that there was little interest.

As a result of the above issues the measure objective was revised so that only vehicles operating out of the consolidation centre would be allowed to use the bus lanes on the most suitable corridor into Norwich. This revised proposal had a number of advantages:

- the number of vehicle deliveries using the bus lanes would be limited to approximately 2 to 5 times a day, so minimising the interaction with cyclists
- the vehicles would have consolidation centre livery on their sides, making identification of vehicles that can legitimately use the bus lane easier.
- the drivers of the consolidation centre vehicles would be known and their driving behaviour in the bus lane monitored. Drivers would also have appropriate training to make then more aware of the presence of cyclists.

Key Results

- Only limited benefits have been found to occur as a result of the use of the Newmarket Road bus lane by freight vehicles from the consolidation centre. As a result of the bus lane usage between November 2007 and October 2008:
  - the estimated fuel consumption reduction was 17.1 litres
  - the estimated CO_2 emission reduction was 26.661 kg
  - it is estimated that there was no effect on vehicle trip distance.
- Three key reasons have been identified for the small benefits that have been found to occur. These are:
  - The main benefits from using an inbound bus lane only occur during the morning peak period and the consolidation centre movements are not always being undertaken at this time.
  - The Newmarket Road bus lane is generally 3.0m wide and this does not provide sufficient width for vehicles to overtake cyclists without moving into the outside lane. During the morning peak period the outside lane has queued traffic which meant that in freight vehicles were unable to pull out to pass any cyclists (or buses at bus stops) using the bus lane. This reduced the time saving benefits provided by the bus lane. Similarly HGVs can be delayed by buses waiting at bus stops.
  - The length of bus lane that can be used is small when compared to the overall journey length from the consolidation centre to the city centre.
- An additional benefit of the bus lane was envisaged to be the higher profile for the consolidation centre vehicles. It would appear that there are greater factors influencing the decision to use the consolidation centre than the priority use of bus lanes (see summary for measure 10.5).
- The use of a bus lane by HGVs has produced some negative reaction, particularly from cycling organisations. They believe that it is unsafe for HGVs and cyclists to mix in the bus lane.

Recommendations

- Recommendation 1 – Review the technical specification of bus lane provision so that the space available is wide enough to allow easy co-existence between cyclists and essential large vehicles to which priority might be offered.

Transferability

This type of measure may work best in cities which have routes suitable and convenient for use by freight vehicles. The need for appropriate means of priority access for these vehicles should be balanced with needs of other possible route users – this may well be challenging.

Components relevant to transferability of measure 10.4	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Geographical area covered / existing infrastructure				
	Access routes	High	0	The priority access route is a major radial route into the city centre. It has a bus lane which the freight vehicles (and cyclists) also use. It is also a direct route between a centre for consolidating freight deliveries to Norwich - another SMILE measure - and the city centre. (See also 'Implementation'.) Use of the bus lane benefits freight vehicles as it provides priority access. However this also has a disadvantage - the width of the bus lane prohibits freight vehicles from overtaking cyclists without moving into the normal traffic lane. During morning peak hours this has slowed down freight vehicles (and buses). (See also 'Stakeholders involvement.'). This measure could be transferred to other cities with routes that have potential to be used for priority access by freight vehicles.
Stakeholders' Involvement				
	Other route users	High	0	Cyclists objected to freight vehicles' use of bus lanes on a major route into Norwich city centre. Although these concerns have not resulted in the measure being withdrawn, they became very political, suffering from negative press and featuring strongly in a local election campaign. Whilst the measure was intended to increase the sustainability of freight movements, cyclists saw it as undermining the sustainable transport mode of cycling. The potential to transfer this measure elsewhere may be influenced by whether users of other forms of transport share priority access routes and the level of support for any objections raised. It should be considered whether knock-on benefits can be demonstrated for those who may be concerned, e.g. freight vehicles using bus/cycle lanes will result in less congestion in a city centre, thereby benefiting cyclists in the centre.
Implementation				
	Conditions attached to use of route	Medium	0	It was originally proposed that only freight vehicles meeting certain emissions standards should have priority access. This proved unfeasible for various reasons, including difficulty in identifying vehicles which met the desired standards.

Components relevant to transferability of measure 10.4	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				Instead only freight vehicles which used the urban consolidation were allowed on the priority access route. Other cities considering adoption of this measure will need to investigate the feasibility of ensuring that route users are environmentally friendly vehicles. This will depend on availability of data about vehicles, and the level of enforcement and regulation of emissions standards. If this is not realistic, it may be possible to attach other conditions to use of the route which are designed to improve sustained, as in Norwich.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 7 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	41,680	0	0	-41,680	-41,680
Year 2	0	1,100	0	-1,100	-42,780
Year 3	0	1,100	0	-1,100	-43,880
Year 4	0	500	0	-500	-44,380
Year 5	0	500	0	-500	-44,880
Year 6	0	500	0	-500	-45,380
Year 7	0	500	0	-500	-45,880
Total	41680	4200	0	-45,880	
NPV	40271	3675	0	-43946	
Average net present annual cost				-6278	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	52794	5320	0	-58114
NPV	51009	4656	0	-55664
Average net present annual cost				-7952

The impact of the priority access on vehicle speeds and emissions has been assessed to be marginal and within the uncertainty of such measurements. Therefore, the cost effectiveness of this measure in its current form is based on effectiveness of zero demonstrated benefit.

3.2.11 Measure 10.5: Urban Freight Consolidation Centre

The measure involved the establishment of an urban freight consolidation centre to facilitate the use of clean and energy efficient goods vehicles in the urban area. Following a tender exercise with interested operators, Norfolk County Council entered into an agreement with a local freight transport operator to provide the freight consolidation centre. The chosen consolidation centre site was situated 20 miles south west of Norwich has significant warehouse storage available, with fast and direct transport links to the central core of the Norwich, as well as the national trunk and primary road network and the rail network to provide modal choice for transport outside the central core of the city. A manager for the consolidation centre was employed to develop a customer base for it. Procedures to facilitate the function of the consolidation centre, such as new signing, leaflets and priority traffic movements for freight moved through this centre (see measure 10.4) were established.

Key Results

The key results of the freight consolidation section of the freights measures (which was evaluated in a cluster with measures 10.3 and 10.4) were as follows:

- The preferred partner to operate the consolidation centre was chosen to provide the longer term sustainability of the project as the partner did not require significant subsidies in future years. Instead the partner would undertake the consolidation centre activities as part of its current business.
- The consolidation centre only has a limited number of clients at present and as a result this limits the amount of consolidation of deliveries that can be undertaken. However, the centre has had the effect of replacing some large articulated vehicle movements into the city centre with smaller 7.5T rigid vehicle movements. This provided benefits of reduced fuel consumption and emissions. The following tables summarise the separate and combined effects on fuel consumption and emissions resulting from measures 10.3, 10.4 and 10.5 over the period November 2007 to October 2008:

Measure - fuel consumption	**Overall Effects** **(Litres)**	**Effects per Veh** **(Litres/vkm)***
Measure 10.5 (Freight Consolidation Centre) Effect on fuel consumption resulting from consolidation centre	297.2 reduction	0.113 reduction
Measure 10.4 (Priority Access for Cleans Goods Vehs) Effect on fuel consumption resulting from bus lane	17.1 reduction	0.006 reduction
Measure 10.3 (Freight Stakeholders Club) Effect on fuel consumption resulting from stakeholders club	No change	No change
All measures combined effects	314.3 reduction	0.119 reduction

Measure - fuel consumption	Overall effects CO_2 (kg)	Overall effects CO (g)	Overall effects NOx (g)	Overall effects PM_{10} (g)
Measure 10.5 (Freight Consolidation Centre) Effect on emissions resulting from consolidation centre	1359.6 reduction	347.2 increase	7805.5 reduction	61.8 reduction
Measure 10.4 (Priority Access for Cleans Goods Vehs) Effect on emissions resulting from bus lane	26.7 reduction	75.0 reduction	141.5 reduction	10.9 reduction
Measure 10.3 (Freight Stakeholders Club) Effect on emissions resulting from stakeholders club	No change	No change	No change	No change
All measures combined effects	1386.3 reduction	272.2 increase	7947.0 reduction	72.7 reduction

- If further retailers could be encouraged to use the consolidation centre, there should be a marked increase in benefits as loads could be consolidated together.
- The partner contracted to operate the consolidation centre was chosen because it was able to offer longer term project sustainability. This partner did not require significant subsidies in future years; instead it is undertaking consolidation centre activities as part of its current business.
- Obtaining clients for the consolidation centre proved difficult. The reasons for this are considered to be:

- delivery into Norwich may not be as difficult as first envisaged, particularly during off peak periods
- retail businesses are reluctant to change their existing delivery practices established over a period of time. There is an element of risk for them changing, particularly when there is no significant existing problem and no financial gain to them
- changing delivery suppliers on environmental improvement grounds was not a good enough incentive. Some retailers believed the consolidation centre delivery should be free. The poor global economic climate also made retailers reluctant to change established practices.

Recommendations

- Recommendation 1 – Greater incentive is required to encourage use of the consolidation centre. In particular, more control of freight movement within Norwich City centre through stricter restrictions on freight traffic and stricter enforcement would be required in order to drive participation in the consolidation centre.
- Recommendation 2 – Use of support mechanisms such as delivery and servicing plans through the development control process could be use to mandate future use of the freight consolidation centre in conjunction with developers and building owners.
- Recommendation 3 – An operator that is better integrated with existing retail operations within Norwich city centre and with other consolidation centres within the UK might have had more success in recruiting participants.

Transferability

Key factors to consider regarding transferability are: provision of adequate consolidation facilities with good access to a city centre, having a realistic and well resourced recruitment strategy backed up by restrictions and enforcement that favour the consolidation centre and mechanisms for funding and managing the consolation centre.

Components relevant to transferability of measure 10.5	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Services offered/ existing infrastructure				
	Centre facilities and location	High	0	The consolidation centre has significant warehouse storage available. These facilities were already in existence before the measure was implemented. (See also 'Finances'). The centre has a good, direct road link to Norwich city centre, and to the wider road network and rail network allowing transport outside the city centre. Vehicles from the consolidation centre have priority access along the road to the city centre. If transferring the measure elsewhere consideration should be given to how adequate consolidation/storage facilities will be provided. Also, these facilities should be at a site with good transport links. It may be possible to link use of the centre with priority access for deliveries.
Finances				
	Capital and running costs	High	0	A company was contracted to operate the consolidation centre after a tendering process. The chosen company was able to show that it could operate the centre as part of its existing business. This meant that its existing warehouse facilities and vehicle operations could be utilised. Also, whilst SMILE start up funding was provided, the company did not require longer term subsidies. In the short term this made obtaining customers more difficult because the company only had limited retail customers. However, it made the project more sustainable in the longer term. Transferability elsewhere will be influenced by whether due consideration is given to how capital and running costs will be covered. The Norwich model of using a company which can run a centre as part of its existing operations is a useful and sustainable one, if suitable contractors and sites can be found in other cities.
Stakeholders' Involvement				
	Slow take up by clients	Medium	0	The consolidation centre only has a small number of clients at present and this limits the amount of consolidation of deliveries that can be undertaken. One reason for slow take up is referred to under 'Finances'. In addition:

Components relevant to transferability of measure 10.5	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				• - many retailers have been unwilling to change existing delivery contracts • - restrictions on delivery times in Norwich city centre are not sufficient to encourage many companies to use the consolidation centre as an alternative for longer distance deliveries. It is rather difficult to predict how this could affect transferability, as it depends a number of factors including on the nature of potential customers' current delivery arrangements, their level of satisfaction with these, and the existence and extent of delivery restrictions in other city centres. In Norwich and elsewhere it may be possible to introduce incentives to use consolidation centres that are linked to other sustainable transport measures.
Management and organisational aspects				
		High	0	A well established and experienced company was contracted to manage the urban consolidation centre beyond the end of the SMILE project. The comments under 'Finances' are also relevant here.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration:	2.33 years				
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	4,933	0	0	-4,933	-4,933
Year 2	7,872	0	0	-7,872	-12,805
Year 3	25,037	50,340	0	-75,377	-88,183
Year 4	11,013	89,410	0	-100,423	-188,606
Total	48856	139750	0	-188,606	
NPV	44295	123319	0	-167614	
Average net present annual cost				-71937	

Adjusted to Euros, allowing for purchasing parity conversions					
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	
Total	61884	177015	0	-238899	
NPV	56106	156203	0	-212310	
Average net present annual cost				-91120	

The impact on pollutant emissions from the first 12 months of operation of the consolidation centre were as follows:

CO_2: reduction of 1359.6 kg

CO: increase of 347.2 g

NOx: reduction of 7.8 kg

Particulates: reduction of 61.8 g

Assuming no future change to the operating regime of the freight consolidation centre and converting these values to annual terms then cost effectiveness values become:

CO_2: £ 52910 per tonne or € 67020 per tonne

CO: -£ 207 per g or -€ 262 per g

NOx: £ 9216 per kg or € 11674 per kg

Particulates: £ 1164 per g or € 1474 per g

3.2.12 Measure 10.6: Goods Delivery to Park & Ride Sites

Six sites on prime locations alongside radial routes on the edge of Norwich have been secured over time to provide a highly visible service with a route to the city centre. The Council's strategy has been to offer good, secure site facilities and a high quality, affordable and reliable bus service to offer a realistic alternative to the car user.

The introduction of a goods delivery service using some of the existing Park and Ride service was aimed to support this strategy and offer added benefits to passengers using the service. Service users dropped off purchases at various points within Norwich city centre. These goods were subsequently collected by a van operating a shuttle service from these points and delivered to three local Park & Ride sites. This was referred to as the 'Shop & Go' service.

Key Results

A survey was conducted in May 2007 to assess awareness of the 'Shop & Go' service. There were 808 respondents. The key results were as follows:

- 35% of respondents had used Park & Ride. This suggests a large potential customer base for the 'Shop & Go' service any that publicity at Park & Ride sites could attract new service users. Of the 35% already using Park & Ride, 32% had heard of the Shop & Go service
- 16% of Park & Ride users were potential Shop & Go customers, as they had indicated they might use the scheme. This highlights the potential longevity of the scheme.
- Concerning publicity for the service, newspaper and radio adverts had the greatest audience. (Advertising campaigns were aired on local radio stations and press releases were printed in local newspapers at key shopping periods, Christmas and just before local holidays.)

Usage of the Shop & Go service was also analysed. The following table shows total number of service users associated with each Park & Ride site.

Park & Ride site	Operation	Total no. of customers
Harford (2006)	Monday to Friday, December 2006 to January 2007	82
Harford (2007)	Monday to Friday, April 2007 to January 2008	132
Norwich airport	Tuesday to Saturday (Monday to Saturday from October 2007), April 2007 to January 2008	105
Thickthorn	Monday to Saturday, October 2007 to January 2008	117

Other key findings were as follows:

- The majority of customers were female and aged 36 or older. This information can aid targeted publicity in future.
- Customers' travel was within a 60 mile radius of the Park & Ride sites. It was evident that customers were prepared travel to their nearest Park & Ride site rather than travel across the city centre.
- Saturday usage of the service was nominal, suggesting that at weekends customers either make few larger purchases, or drive into the city centre and transport larger purchases home by car.

- The earliest time for the delivery service to collect purchases within the city centre was 12.00pm. The lack of demand for the service in the morning period was favourable, as overheads for drop off/subsequent collection point staffing and driver hours were reduced. Drop off/collection times between 1200pm-1500pm appeared to work well.
- Multiple drop-off points in the city centre were attractive to customers, as this provides flexibility and reduces carrying of heavy goods.
- There was limited demand for drop off at points hosted by retailers who would only accept their own goods.
- To make the scheme successful, retailers hosting drop off/subsequent points need to accept goods dropped off from all stores, not just their own.

Recommendations

- Recommendation 1 – Implementation would be possible in other cities with Park & Ride, or who have an edge of city, staffed car park where goods can be left for collection by customers.
- Recommendation 2 – Variations of this service could be offered involving customer collection of goods at bus or rail stations. This should encourage use of other transport modes, although security precautions at stations would need careful consideration.
- Recommendation 3 – Locally, the delivery service should not be made available before 12pm, as an insufficient quantity of goods are purchased in the morning period. Timing of purchases may vary in other cities, and data on this may need collecting. However, it will still be the case that a sufficient number of purchased goods would need building up at drop off/subsequent collection points from when retailers open each day, in order for the delivery service to be viable.
- Recommendation 4 – 'Word of mouth' is an important publicity tool, as it was found that many customers were repeat users and often promoted the scheme to friends and colleagues.
- Recommendation 5 – Ensure that all drop off/subsequent collection points accept goods from all stores, otherwise these points will be under used.
- Recommendation 6 – Ensure that all collection point staff are fully briefed on the service.

Transferability

There appears to be reasonably good scope for transferring this measure elsewhere. Key factors to consider when transferring the measure elsewhere are: availability of suitable park and ride services/sites or other accessible parking sites; funding sources for capital and running costs; securing involvement of and contribution of resources by major retailers; timing and seasonality of the service; publicity arrangements and the current economic climate.

Components relevant to transferability of measure 10.6	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Services offered/ existing infrastructure				
	Availability of park and ride sites	High	1	There are six park and rides in prime locations on the outskirts of Norwich alongside radial routes into the city centre. They provide reliable and affordable bus services into the city centre which are a realistic alternative to the car. The availability of this level of services and infrastructure was an important factor in setting up goods delivery to out of city sites. The measure leader has noted that implementation of this measure could be possible in other cities with adequate park and ride services, or edge of city staffed car parks where goods can be left for collection.
	Timing and seasonality of service	High	1	It was originally intended to offer this service all year round, Mondays to Saturdays. However following discussion with retailers, it was agreed to operate it in peak shopping periods (Christmas and school holidays). Analysis of service usage showed it is only economically viable from the end of October to December, in the run up to Christmas and the subsequent sales period. In 2008 the service will reduce to Christmas only. For other cities considering implementation, it may only be feasible to run the service during peak shopping days and seasons, and take up should be monitored to inform future operation. See also 'Wider issues'.
Geographical area covered				
	Status of Norwich as a retail centre	Medium	2	Norwich is a major retail centre of regional significance. For a goods delivery service to park and ride sites to be viable elsewhere, a certain level of retail and customer activity may be required.
Target Population				
	Service Users	Medium	1	Monitoring and evaluation of service take up has provided information about which sections of the local population use the service the most and their shopping behaviour. This can be used to inform future developments in the service and targeted publicity. Other cities considering implementation may wish to survey

Components relevant to transferability of measure 10.6	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				potential demand during scoping as well as devising arrangements for monitoring actual usage. See also 'Awareness and communication'.
Finances				
	Capital and running costs	High	0	Funding was required for delivery vans, staff operating the scheme and publicity. Some retailers contributed funding and staff, see 'Stakeholders involvement'. In Norwich the long term viability of the measure is dependant on securing funding from the retail sector. See also 'Wider issues'. Therefore adequate provision will need to be made for capital and running costs if the scheme is to be implemented successfully elsewhere.
Stakeholders' involvement				
	Retailers Involved	High	0	Involvement of retailers has been key to measure implementation. They have been supportive if they can see commercial benefits in terms of increased sales or footfall. Certain retailers provided goods collection points at their stores, publicised the scheme in-store, and two department stores each provided and funded a van and driver for deliveries. However other retailers did not want to participate in the scheme, and one retailer withdrew a van and driver at very short notice. Implementation in other cities may be most feasible where there are department stores and/or shopping malls willing to become involved and contribute resources. See also 'Finances' and 'Wider issues'.
Awareness and communication				
	Publicity	High	1	Awareness of the scheme has been vital to take up. A comprehensive publicity campaign was run, including advertising in local media, banners, posters and leaflets, promotion via various websites, and an associated competition for members of the public. Stakeholders - retailers and park and ride bus operators - also had an important role in publicising the scheme. Transferability elsewhere will be aided by development of marketing and publicity strategies. See also 'Target population'.

Components relevant to transferability of measure 10.6	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Wider Issues				
	Economic	Medium	-1	The downturn in the economy is a potential barrier to implementation in Norwich and elsewhere. As noted under 'Services offered', in Norwich the service is operating over a reduced time period this year.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 6 years					
Year	Expenses: Set-up Costs (Fixed Cost)	Expenses: Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	0	4,142	0	-4,142	-4,142
Year 2	0	23,931	0	-23,931	-28,073
Year 3	0	129,617	0	-129,617	-157,690
Year 4	0	9,000	0	-9,000	-166,690
Year 5	0	7,500	0	-7,500	-174,190
Year 6	0	7,500	0	-7,500	-181,690
Total	0	181690	0	-181,690	
NPV	0	163508	0	-163508	
Average net present annual cost				-27251	

Adjusted to Euros, allowing for purchasing parity conversions					
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	
Total	0	230139	0	-230139	
NPV	0	207108	0	-207108	
Average net present annual cost				-34518	

The impact of goods delivery to Park and Ride sites has been minimal in comparison to the overall use of Park and Ride in Norwich. The measure as implemented has highlighted that it only has value in the peak periods up to Christmas, and as such it would be inappropriate to include an assessment of cost effectiveness based on the demonstration as implemented so far, although it is clear that the values would be dependent upon a benefit close to zero.

3.2.13 Measure 11.3: Travel Planning

Norfolk County Council worked with organisations in the Norwich area to support the development, implementation and monitoring of site specific travel plans. The measure objectives were to:

- support travel plans with 20 businesses and all 80 schools in the area, these covering travel of employees and students
- reduce impacts of traffic such as car parking, congestion, road traffic danger and environmental pollution, by bringing about a reduction in single occupancy vehicles by 5%
- improve health, by encouraging more people to walk and cycle to work or school rather than travel by single occupancy cars

- widen travel choice and improve accessibility, by encouraging more people to use public transport and car share.

Key Results

A high number of organisations were aware of the measure and 108 travel plans were submitted, 20 for businesses and 88 for schools (8 new schools opened during implementation of the measure). This had a big impact locally. There were positive modal shift results bringing about a decrease in car use and demonstrating organisations' eagerness to promote sustainable travel:

- the 88 school travel plans collectively exceeded the target of 5% reduction in single occupancy vehicles, delivering a 10.9 % modal shift. The fuel and CO_2 savings per annum respectively were 514,332 litres and 1134 tonnes
- Of the 20 workplace travel plans, data available from 4 showed a 10.75% reduction in single occupancy vehicles travelling to the establishments.

The high level of participation in travel planning also suggested that the measure was implemented at the right time, when concerns for health and the environment were regularly covered in the media. The travel plan benefits of health, safety and carbon footprint reduction were supported by national campaigns, which helped to reinforce travel planning messages prompting individuals to take action and get involved. Rising fuel costs and congestion problems were also driving factors.

Collectively the results gave an excellent insight into what can be achieved with a travel plan. Comparisons between the sites enabled conclusions to be drawn:

- where dedicated travel plan 'champions' robustly implemented plans, sites produced very high levels of modal shift.
- sites where little activity was undertaken delivered poorer results.

Implementing initiatives to solve site specific issues such as car parking problems encouraged much networking and co-operation with neighbours to make initiatives work; in particular:

- the development of 10 car share schemes was slow at first, but gathered momentum as workplaces jointly established wider groups with higher membership and greater rates for matching sharers. The Highways Authority was involved in the promotion of one scheme, seeing the need to work with businesses that had a large impact on major roads.
- shuttle bus schemes were very successful at reducing on site parking. Two local employers confirmed that their schemes which were originally set up as pilots would continue. For these two schemes, there were mixed results in terms of impact on route congestion and CO_2 reduction.

A standard workplace staff travel survey was made available. Questions covered a range of issues, including existing means of travel, how people would like to travel, fitness, safety perceptions, barriers to more sustainable travel, how change to more sustainable modes could be encouraged and suggestions for improvements. The impact of undertaking the survey was far reaching. Thus its use was integral to development and implementation of effective travel plans, and in encouraging acceptance of the measure:

- the baseline data obtained for each site gave a good starting point for site specific travel plan development.
- the survey was the start of an education process, ensuring that everyone who participated was aware of wider travel options as alternatives to single occupancy car travel. Health, safety and environmental themes were woven into the survey; this further embedded the measure as a

lifestyle change rather than an anti car initiative, which could potentially alienate people, particularly those living in rural locations who rely on their cars.

- the survey laid the foundation for behavioural change in a subtle but personal way. People undertaking it were primed to receive all the subsequent messages sent to them during the promotion of travel plan initiatives.
- commitment to complete the survey was an indication of an individual's decision to participate in the measure. Individual contribution was important to the success of the measure.
- the survey provided individuals an opportunity to shape the travel plan for their organisation, giving shared ownership of the plan.

Recommendations

- Recommendation 1 – The measure could be taken up by other cities. The use of travel plans is an essential element in developing a sustainable transport strategy for the future. Travel Plans should take a holistic view of sustainable travel. They should encourage establishments to take ownership of and address transport and related health and safety issues.
- Recommendation 2 – Travel plans should be site and people specific, giving clear guidance from users of what is needed to support sustainable travel from both infrastructure and transport facilities. Plans should be used as tools for measuring, managing and minimising the reduction in single occupancy car trips, and should be used for all behavioural change, infrastructure and soft measure interventions. Travel plans should provide a process for collecting travel data relating to individuals covered by the plans. This should be done before and after implementation in order to measure actual behavioural change.

Transferability

There appears to be reasonably good scope for transferring this measure elsewhere. Key factors to consider when transferring the measure elsewhere are: staff time, commitment and skills needed for overall management of travel planning and for development/implementation on-site; what other resources can be provided to support travel plan development and implementation; and whether planning legislation can be used to require production of travel plans for new developments.

Components relevant to transferability of measure 11.3	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Links to various strategies	Medium	1	The measure links to Norfolk County Council's Smarter Travel Choices and Sustainable Travel to School strategies. It is also playing a key role in the delivery of certain national indicators required by the County Council's Local Area Agreement (which sets out the priorities for a local area agreed between central and local government). These indicators include adapting to climate change and young people's participation in positive activities. Implementation in other cities could be facilitated if the measure is integrated with and shown to benefit a wider strategy or strategies.
Human Resources				
	Measure Staff	High	0	The measure leader identified the following key driver; employing a team of travel planning staff with enthusiasm for sustainable travel, and an understanding of behavioural change and public engagement. It also worked well giving each team member a group of establishments to manage. Other cities contemplating this measure will need to consider what staff time can be made available for travel planning and ensure staff have appropriate skills.
Stakeholders' involvement				
	People in travel plan organisations	High	0	Involvement of people within travel plan organisations was another driver. This is linked to the fact that the overall travel planning approach is people centred and site specific. Support from senior managers was crucial. Also, Travel Plan Officers were appointed to support travel plan development, keep up momentum during implementation, and engage with colleagues through face to face contact. Other cities involved in travel planning may wish to consider a similar approach. See also 'Awareness and communication' about the role of the local media.

Components relevant to transferability of measure 11.3	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Legal and Contractual Requirements				
	Planning conditions	High	0	Planning conditions for new development sites (section 106 agreements) are being utilised to ensure developers prepare and implement travel plans for development sites. Transferability will be influenced by the extent and nature of planning regulations in other cities.
Organisational Aspects				
	Networks of organisations with travel plans	Medium	1	Some networks of organisations with travel plans have been set up, e.g. schools' and companies at a business park. Other cities contemplating this measure may wish to consider establishing networks of organisations with similar needs, including those located at the same site such as a business or retail park.
Technical Requirements				
	Online survey tool	High	1	An online survey tool was developed to provide a robust, relatively quick and common method for collecting, storing, analysing and accessing a) baseline data about travel modes of people covered by travel plans and b) subsequent data for monitoring of modal shift. Online surveying is also environmentally friendly reducing the amount of paper used. Other cities considering implementation of travel planning should investigate providing a standard survey tool. It would be useful to draw on experience and advice from Norwich.
Implementation				
	Supporting resources	High	1	There are a number of other resources which are being used to support development and implementation of new travel plans, e.g. travel plan template, dedicated website, guidance and a rolling programme of smart travel promotions. The extent to which these can be transferred elsewhere will partly depend on availability of staff time and funding to provide such resources. Other cities could learn from the many examples of good practice in Norwich.

Components relevant to transferability of measure 11.3	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Awareness and Communications				
	Media support	Medium	0	The local media have been very supportive of the measure, with comprehensive coverage of most travel plan events and other promotions. Transferability to other cities may be influenced by the nature of existing relationships with the local media.
Technical Requirements				
	Public/organisational concerns	Medium	1	It was demonstrated that travel plans may be used to address public/organisational concerns about climate change, congestion, parking problems, fuel price rises and health. These kinds of concerns may well exist elsewhere.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 6 years					
Year	Expenses: Set-up Costs (Fixed Cost)	Expenses: Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	31,116	6,223	0	-37,339	-37,339
Year 2	27,821	5,564	0	-33,385	-70,724
Year 3	25,557	73,237	0	-98,794	-169,518
Year 4	51,114	106,436	0	-157,550	-327,068
Year 5	0	0	0	0	-327,068
Year 6	0	0	0	0	-327,068
Total	135608	191460	0	-327,068	
NPV	123629	170015	0	-293644	
Average net present annual cost				-48941	

Adjusted to Euros, allowing for purchasing parity conversions					
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	
Total	171769	242514	0	-414283	
NPV	156595	215351	0	-371946	
Average net present annual cost				-61991	

The impact of the school travel plan elements of this measure have been estimated to have brought about an annual reduction in CO_2 emissions of 1134 tonnes. Although the mode split impact of the workplace travel planning is expressed in terms of reduction in single occupancy car use, this is not converted to energy and emissions data.

Therefore, the cost effectiveness values are based solely on the reduction in CO_2 emissions brought about by the school travel plan elements of the measure. The resources applied to the two elements are judged to be proportional to number of plans completed under each element, meaning that 81.5% of the cost is used for the cost effectiveness calculation.

Converting to cost per tonne values, this gives approximate values of £35.2 per tonne of CO_2, or €44.5 per tonne of CO_2 using the same purchasing power parity factor as applied to the other measures.

3.2.14 Measure 11.4: Car-Pooling

Note that car-pooling is normally referred to as car sharing in the UK. This measure identified workplaces and schools in the Norwich Area which could benefit from car share schemes. These establishments were approached and supported through set up and implementation of schemes, with members either in private or public groups. The measure sought to:

- Contribute to a reduction in local congestion, by decreasing the number of commuters travelling to the establishments by single occupancy car trips.
- Contribute to a reduction in environmental pollution measured as a reduction in CO_2 emissions.
- Reduce the number of miles travelled by commuters to and from their workplaces.
- Reduce the cost of commuting, by decreasing the number of miles travelled by individual commuters.

Key Results

The key results were as follows:

- The measure raised public awareness and improved perceptions of car sharing. It did so by dispelling some misperceptions of and barriers to car sharing among the general public, particularly in relation to safety. A public survey was carried out in the Norwich urban area. 805 respondents replied to a question about awareness of the car sharing scheme. Over one third (36%) had heard of the car sharing scheme in Norwich. 2% knew the scheme was called 'CarShareNorfolk.com', 92% said that they did not know what it was called and 6% thought it was called something else. 287 the respondents replied to a question about the safety of car sharing. 73% felt car sharing was either a very safe (19%) or a fairly safe (54%) form of transport, whilst just 10% felt it was either very unsafe (2%) or fairly unsafe (8%).
- Modal shift outcomes were positive, with workplace car-sharing contributing to the move away from single occupancy car trips. 76% of commuting car sharers previously travelled by single occupancy cars.
- Implementation of the measure saved a total of 371 tonnes of CO_2 each year and 1,395,165 miles travelled on roads by commuters, the latter contributing to reduced congestion. A total of £319,370 was saved on fuel and car running costs by the citizens who were car share scheme members.

Recommendations

- Recommendation 1 – Promotion of the car share scheme to the general public should be continued locally through ongoing publicity. A rolling programme of campaigning should be established highlighting the personal financial savings. Regular car share 'champion' training events should be held, including specific focus on car share marketing and promotions. All local travel plans should feature access to Personal Travel Advisers to deliver behavioural change.
- Recommendation 2 – Car share schemes should continue to be offered as public or private groups to all establishments with travel plans. This should include residential developments, where car clubs should also be set up for new residents who are being accommodated in housing with limited car parking. Budgets should be secured for all travel plan initiatives to ensure implementation.
- Recommendation 3 – Innovative ways to integrate car sharing into other areas of business travel should be explored and this should be promoted effectively. It should be ensured that eco driving advice and training, and access to car clubs are part of any car share package.
- Recommendation 4 – The car share measure is worthwhile and could be taken up by other cities. Car share schemes should be proactively implemented by establishments, which need to take responsibility and ownership of schemes and find ways to increase membership. The success of

any scheme relies on critical mass. Thus it is important to ensure that schemes attract new members to replace people who have moved away and left their car share partners unable to share.

Transferability

There appears to be reasonably good scope for transferring this measure elsewhere. Key factors to consider when transferring the measure elsewhere are: securing funding and workplace management support for implementation of car pooling schemes with critical mass.

Components relevant to transferability of measure 11.4	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Links to various strategies	Medium	1	The measure links to Norfolk County Council's Smarter Travel Choices and Sustainable Travel to School strategies, and its travel planning initiative. It is also playing a key role in the delivery of various national indicators required by the County Council's Local Area Agreement (which sets out the priorities for a local area agreed between central and local government). These indicators include adapting to climate change. Implementation elsewhere could be aided if the measure is integrated with and shown to benefit a wider strategy or strategies.
Stakeholders' Involvement				
	Users	Medium	1	Concerns existed amongst users/potential users about safety and restrictions to personal freedom. This was partly addressed in Norwich (and could be elsewhere) by integrating car pooling schemes into organisational travel plans and providing individual travel advice.
	Managers/funding	High	0	Management support at workplaces for car pooling schemes has been good, but not enough. Funding is required for implementation and promotion of schemes (see also 'Awareness and communication'). Work is underway on a business case for car pooling, in conjunction with a local, university-based company supporting innovative carbon reduction projects. It may help other cities considering implementation if the measure is delivered via organisational travel plans. Advice could be sought from Norwich on likely costs and making a business case (see also 'Wider issues').
Organisational Aspects				
	Critical mass	High	0	The measure leader has stressed that critical mass is required for car pooling schemes to operate successfully. Smaller businesses may not have enough staff to achieve critical mass, but there may be staff concerns about the safety of sharing with potential users from other workplaces (see also 'Stakeholders involvement'). Other cities contemplating this measure will need to work on achieving critical

Components relevant to transferability of measure 11.4	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				mass in conjunction with organisations. This could be facilitated by creating networks of organisations with travel plans.
Technical requirements				
	Software	Medium	1	The measure used a software package to arrange car pooling. This was already available from a company developing car sharing nationally (although there was subsequently some wrangling over their terms of supply). Other cities looking at this measure should consider what mechanism(s) will be used to match car sharers, including whether there are existing systems that can be adopted or adapted.
Awareness and communication				
	Marketing	Medium	0	There was a concerted effort to promote and market car pooling. This involved collaboration between the measure leader and organisations launching car pooling schemes. Other cities contemplating the measure should consider marketing arrangements and how these will be financed.
Wider Issues				
	Public/organisational concerns	Medium	1	Public/organisational concerns about fuel price increases, climate change, congestion and parking problems were exploited during measure development and implementation. Such concerns may well exist elsewhere

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 6 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	6,298	1,260	0	-7,558	-7,558
Year 2	5,494	1,099	0	-6,593	-14,151
Year 3	5,785	1,210	0	-6,995	-21,146
Year 4	11,279	58,800	0	-70,079	-91,225
Year 5	0	0	0	0	-91,225
Year 6	0	0	0	0	-91,225
Total	28856	62369	0	-91,225	
NPV	26260	54575	0	-80836	
Average net present annual cost				-13473	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	36551	79000	0	-115551
NPV	33263	69128	0	-102391
Average net present annual cost				-17065

The measure as implemented has delivered a reduction of 371 tonnes CO_2 per annum since its inception.

Converting to cost per tonne, using the average annual cost of implementation this approximate values of £217.9 per tonne of CO_2, or €46 per tonne of CO_2 using the same purchasing power parity factor as applied to the other measures.

3.2.15 Measure 11.5: Individual Travel Advice

The University of East Anglia (UEA) is situated approximately 3 miles from the centre of Norwich in an edge-of-city, semi rural location. Alongside its teaching & research facilities the campus provides a “home” for around 3,500 of its 16,000 students and employment for around 3,000 staff. In addition to the main campus the University has a recently built School of Nursing & Midwifery located approximately 1 mile from the main campus opposite the Norfolk & Norwich University Hospital. The University’s sister institutes, John Innes Centre & the Institute of Food Research are around the same distance to the west of the main campus.

The University developed and adopted a Travel Plan in December 2002. The aim of the Travel Plan is to; “Ease the car parking problems at the University and reduce the University’s environmental impact through a reduction in non-essential car use, achieved by creating opportunities for staff, students and visitors to travel by alternative means of transport to the private car or to travel in ways which reduce the number of one-person, one-car commuter journeys" Delivery of the Travel Plan has centred on the need to provide new infrastructure to support walking and cycling, provision of a lift sharing scheme including a database of potential sharers, along with benefits such as reserved parking and improvements to local bus services including reducing the cost of travel. Whilst there has been a marketing strategy in place this has sought to raise awareness across the community rather than focusing on individuals.

This basis and interest in the results of the Personalised Travel Planning (PTP) projects elsewhere led UEA first to trial a PTP project for staff and students and then to extend the programme to evaluate the potential in local residential areas.

Key Results

The key results are split into two separate elements, firstly for the pilot solely within the university and then for the wider PTP intervention in the surrounding community.

The key results from the UEA intervention are as follows:

- a 1% modal shift away from the car and in particular sole occupancy journeys, has been achieved
- 50% of the Universities community travel by foot or cycle
- there had been a significant increase in the number of shared journeys from just under 1% in 2005 to 7% in 2008; there have been 240 new registrations on the University's lift share data base during the measure
- Where there had been contact with the Personal Travel Service 70% (Survey 2) and 50% (Survey 3) had tried an alternative mode.
- 14% of those who received unsolicited information had made changes to travel behaviour even though they had not originally been interested to do so
- the 2 specific cycling schemes had been very successful; 39 of the 48 who participated in the "try-before-you-buy" scheme went on to buy a bike and now cycle 2- 3 times each week
- 122 people had changed their travel behaviour outside of the "commute" demonstrating greater awareness of the reasons for effecting change has a wider impact
- only 4% of those surveyed rated the value of the service as of little or no value
- The use of public transport had not altered

The key results from the wider personalised travel planning intervention are as follows:

- Increased awareness of bus stops (from 96% to 100%), timetable information (from 83% to 93%) and where to get public transport information (from 53% to 83%);
- Increased awareness of cycle routes (from 42% to 78%), BUG (from 5% to 25%), cycling information (from 9% to 39%) and walking information (from 9% to 48%);
- Increased awareness of City Car Clubs (from 36% to 43%) and Car Sharing Databases (from 22% to 36%);
- The majority of respondents who received the information (82%) found it useful;
- Over half (58%) of the respondents who had received the personalised travel planning information would like to receive the information again if it was offered in the future;

- More respondents who had received the PTP information agreed that they drove more fuel efficiently, were more aware of local transport facilities and walked more than those that hadn't received the PTP information;
- Perceptions of Public Transport did not alter;
- For the majority of respondents travel habits and patterns remained unchanged.
- Perception relates with the level of awareness i.e. where perception is negative, awareness level is low and where perception is positive, awareness level is high.
- Kilometres travelled did not appear to be influenced by PTP in the study area, although there was a large increase in bus travel recorded in the after surveys by people who had received PTP advice.

Recommendations

- Recommendation 1 – Implementation would be possible in any other public or private sector organisation with the resources necessary to provide what is a labour intensive means of eliciting change
- Recommendation 2 – The two cycle schemes provided as part of the measure contributed to its overall success and could be implemented without the need to offer a Personalised Travel Service
- Recommendation 3 – Understanding the audience is important and choosing who to target and how, will be very dependent on the organisation. Whilst the focus of the measure was initially to target drivers with information the general awareness raising that has been a by product has helped to deliver the overall aim. Those who drive whether targeted or not have become more aware of the issues surrounding sustainable travel.
- Recommendation 4 – A formal Travel Plan and/or parking policy is not necessary but is seen as helpful.
- Recommendation 5 – Partnership working with providers of transport services including bus and train operators is necessary to deliver a successful outcome.
- Recommendation 6 – this is not an "anti car" campaign; offering help with lift sharing and use of car clubs is recommended to avoid being seen as "unrealistic".
- Recommendation 7 – survey 3 revealed those who tried a sustainable mode of transport did so for less than a week; this may not be enough time to realistically assess if the mode could be viable. Initiatives may need to focus on offering longer term "introductory offers" and securing commitment to trying a different mode for an agreed time period e.g. a free 10 day bus pass provided where a parking permit is surrendered for the same period.
- Recommendation 8 – Factors which could have an impact on the survey results in the residential personalised travel planning project include seasonal weather changes and the amount of time between receiving information and monitoring. It is recommended therefore that future projects should 'drip feed' information continually throughout the year and monitoring should take place 12 months after the before survey, at the same time of year.
- Recommendation 9 – A different survey technique is suggested for obtaining 'before' and 'after' data. The method of delivering and collecting packs gave a higher response compared to typical postal surveys but it was still low compared with the responses achieved from other personalised travel planning projects where a house visit or telephone call technique was adopted.

- Recommendation 10 – For future projects it is recommended that completed request for information sheets are kept to allow full correlations to be drawn between the types of information requested, how and by whom.
- Recommendation 11 – In- depth statistical analysis such as the use of SPSS (Statistical Package for Social Sciences) wasn't included as part of this project. It would be useful in the future and for other projects to analyse the results more thoroughly to identify the level of significance change between the before and after survey. However for this to be viable a higher sample size might be required.

Transferability

There appears to be reasonable scope for transferring this measure elsewhere, although the apparent lack of success of this PTP project compared to other PTP interventions suggests that the method of delivery and its approach to the issue of sustainable travel can make a big difference to the outcome. Key factors to consider when transferring the measure elsewhere are: identification of target population and availability of funding, staff and other resources to support scheme implementation. Where schemes are offered at organisations they may work best where they can be operated as part of travel plans.

Components relevant to transferability of measure 11.5	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Travel plans	High	1	Individual travel advice was initially provided at the University of East Anglia (UEA) which has a travel plan. The measure leader identified the existence of the travel plan as a driver for the measure. Other cities considering implementation of this measure with organisations may find it works best where it can be delivered as part of organisational travel plans.
Target Population				
	Sectors of population targeted	High	1	The initial target population was the staff and students of the university, particularly car drivers. The measure included targeting prospective students before they started at UEA and this had had a positive impact on existing students once the freshers arrived. The measure was subsequently extended to a residential area in Norwich. In principle it could be extended to other organisations (see also 'Strategies and policies'). The measure leader noted that understanding the audience is important, and choosing who to target and how will be very dependent on the organisation or area involved. If the measure is being implemented at organisations with travel plans, data collected during the travel planning process may help with targeting.
Finances				
	Set up and running costs	High	0	Whilst the UEA personal travel advice service will continue beyond the end of the SMILE project, this will be in a more limited format with some elements of the scheme dropped. It is not yet clear whether the scheme will be extended to other organisations or residential areas in Norwich. Other cities contemplating this measure would need to work with local organisations to identify funding and other resources to support implementation. They could draw on experience and advice from UEA, and other bodies who have implemented personal travel planning. See also 'Human resources' and 'Stakeholders involvement'.
Human Resources				
	Staff required	High	0	Extension of the service in Norwich is likely to depend on another body taking responsibility for this, such as Norfolk County Council. Availability of staff to

Components relevant to transferability of measure 11.5	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				manage and implement schemes will also be a key consideration for other cities interested in this measure. These schemes are relatively intensive in terms of staffing requirements because advice is offered on a personal basis.
Stakeholders' Involvement				
	Businesses affected/interested	High	0	Various types of support were offered by stakeholders. UEA's students union provided space for advice sessions, UEA's bicycle user group assisted with cycling activities, the local bus operator supplied free daily travel cards, and two companies working in the fields of carbon reduction and car sharing assisted with data provision and analysis. Other cities considering implementation of this measure should look at resource contribution by stakeholders - both organisations where the schemes may be provided and other interested stakeholders e.g. bus operators.
Wider Issues				
	Public/organisational concerns	Medium	0	Public/organisational concerns about fuel price increases, climate change, congestion and parking problems were exploited during measure development and implementation. These concerns may well exist in other cities.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration:	6 years				
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	557	3,446	0	-4,004	-4,004
Year 2	1,688	9,813	0	-11,501	-15,504
Year 3	113,400	64,434	0	-177,834	-193,338
Year 4	0	12,576	0	-12,576	-205,914
Year 5	0	12,833	0	-12,833	-218,747
Year 6	0	12,576	0	-12,576	-231,323
Total	115645.25	115677.91	0	-231,323	
NPV	104394	102601	0	-206995	
Average net present annual cost				-34499	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	146483	146524	0	-293007
NPV	132232	129960	0	-262192
Average net present annual cost				-43699

The evaluation of the PTP implementation project has provided some mixed results that have been difficult to interpret in any meaningful way and have not demonstrated the significant reductions in single person car use that have been shown in other PTP projects in the UK and elsewhere.

On the basis of the evaluation of this measure it is not possible to provide emissions reductions that can be used in the cost effectiveness evaluation.

3.2.16 Measure 12.8: Customised Traffic and Travel Information Service for Freight Operators

The original aim of this measure was to examine whether the provision of user information specifically for freight operators would encourage them to adopt cleaner fuelled vehicles. The cost and maintenance implications of doing so were prohibitive, so instead users had to participate in eco-driver training.

A customised viewer was developed to allow freight companies to access some of the traffic and travel information currently collected by Norfolk County Council. The viewer could be installed onto any computer with broadband internet access. It was trialled with two operators. Feedback was obtained, with the intention of providing a single viewer to all freight companies subsequently. The viewer filtered the information that the operators could receive, and had various functions to identify and obtain information on various events. The information provided included:

- Road closures
- Highway works
- Traffic signal failures
- Roads being used for other purposes, e.g. processions.

Having trialled the information viewer and observed how the two freight companies would use it, it was decided a qualitative rather than a numerical evaluation of the measure was appropriate. This was undertaken via interviews with viewer users, to determine its effects and how it could be improved.

Key Results

The key results were as follows:

- There was awareness amongst freight operators that as traffic increases on roads then the importance of good traffic and travel information increases.
- Whilst traffic and travel information can help with the planning of delivery routes prior to setting off, it can also be beneficial during deliveries. For example, during a delivery on a main route information is relayed to the driver that there are road works ahead. The driver then has the option of continuing on the same route and risk being delayed by the works, or taking a longer and potentially unknown route on more minor roads where traffic signing would be of a reduced standard. The decision on the most appropriate choice can be difficult and insufficient information on the amount of delay could lead to the driver automatically remaining on the main route.
- An increased benefit could be achieved if the provision of traffic and travel information could be supported by other information, such as the most appropriate routes for heavy goods vehicles (HGVs) and the locations of weight/width/height restrictions on the highway network.
- Accuracy of the information provided is not dependent on the operating system, but rather the original source of information. For example, the accuracy of information on road works (start, finish, potential delays) is initially dependant on information provided by the designer prior to construction and then the contractor during construction.
- Currently the provision of traffic and travel information does not provide sufficient incentive to charge operators for the viewer or encourage them to adopt cleaner vehicles.

Recommendations

- Recommendation 1 –. When inviting freight operators to participate in a customised traffic and travel information service, there is a need to promote the positive aspects of such information and the benefits to companies receiving the information.
- Recommendation 2 – Freight companies would like information in a simpler form that does not require significant resource to operate.
- Recommendation 3 – The provision of traffic and travel information alone has its benefits without the condition that companies need to adopt cleaner vehicles to receive it. (The cost of clean vehicle technology is high and difficult to offset by the benefits gained from traffic and travel information.) Therefore a dissemination format that can be viewed by all companies could be considered.

Transferability

There appears to be reasonably good scope for transferring this measure elsewhere. Key factors to address when transferring the measure elsewhere are: how set up and maintenance costs will be funded, which links to consideration of technical requirements.

Components relevant to transferability of measure 12.8	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Finances				
	Set up and running costs	High	0	As well as initial set up costs, maintenance implications and associated costs need to be considered. In Norwich there is potential to extend the information service to more freight operators and to provide new types of information. However delivery of this is dependant on investigating and securing funding for maintenance requirements. (See also 'Technical requirements'.) These issues would need to be addressed by other cities contemplating this measure. Costs could be reduced if there are existing systems which could be adapted for this service and in-house staff with appropriate technical skills.
Stakeholders' Involvement				
	Users	Medium	0	It was originally envisaged that freight operators should adopt clean urban principles in return for using the information service. The cost and maintenance implications were prohibitive' so instead users had to participate in eco-driving training. Other cities interested in this measure should consider cost and maintenance implications of attaching conditions to service use, in conjunction with proposed users. Even if it is not possible to get users to adopt clean urban principles, there may be scope for integrating service use with other sustainable transport initiatives, as in Norwich.
Technical and information requirements				
	Information sources	Medium	0	The accuracy of the information supplied is only as good as the accuracy of its original source (e.g. street works officers, design engineers). It is particularly difficult to assess implications for transferability, as this will depend on the type and quality of information sources in other cities.
	Range and format of information provided	Medium		Feedback from users indicated that information is required in a simpler form and that new types of information would be useful. The technical implications of this are to be investigated. (See also 'Awareness and communication'). It is recommended that other cities intending to offer this service develop it in

Components relevant to transferability of measure 12.8	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				consultation with users and seek feedback from them in order to inform possible future refinements. Other cities could particularly benefit from Norwich experience and advice regarding technical and information requirements.
Awareness and communication				
	Users awareness of service benefits	Medium	1	Interest amongst freight operators in utilising the service was fairly limited. The measure leader considered that this may be due to lack of awareness of the type of information that can be offered and its benefits. Concerted promotion of service capabilities and benefits is recommended. Other cities undertaking promotion could draw on evidence from Norwich.
	Consultation with users	Medium	1	User feedback has enabled potential refinements to the service to be identified. See recommendation under 'Technical and information requirements'.
Wider Issues				
	Congestion and fuel price rises	Medium	1	The measure leader identified congestion and fuel price rises as measure drivers, since some freight companies are looking at new ways of reducing their fuel costs. These could well be drivers in other cities.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 7 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	34,000	0	0	-34,000	-34,000
Year 2	0	2,000	0	-2,000	-36,000
Year 3	0	500	0	-500	-36,500
Year 4	0	500	0	-500	-37,000
Year 5	0	500	0	-500	-37,500
Year 6	0	500	0	-500	-38,000
Year 7	0	500	0	-500	-38,500
Total	34000	4500	0	-38,500	
NPV	32850	3974	0	-36825	
Average net present annual cost				-5261	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	43066	5700	0	-48766
NPV	41610	5034	0	-46644
Average net present annual cost				-6663

This measure was downgraded to a trial with two freight operators, which meant that the evaluation was qualitative rather than quantitative and so no results are available to use in a cost effectiveness calculation.

3.2.17 Measure 12.9: Provision of Real Time Passenger Information

This measure aimed to improve the availability of real time travel information for existing and potential public transport passengers locally. Databases of live traffic information were already available to Norfolk County Council, which could be utilised within the measure, including the BUSNET system for tracking bus journeys.

Real time information was provided via mobile phone texting (SMS), display screens hosted by local bus operators and organisations, and the internet. Provision was trialled on a small scale, which lent itself to a largely qualitative evaluation. The information included messages about disruption to services of two local bus operators. These were generated from ‘Disruption Manager’ module supplied by an external company.

Key Results

The key results were as follows:

- There is strong evidence from qualitative feedback that the public and other stakeholders desire the measure to be taken forward and expanded further in Norwich and more widely in Norfolk.
- In technical terms there remains an imperative of developing robust and linked systems to enable high quality real time passenger information to be provided to customers.
- Information systems need to be flexible, so that different users can access the information in the way which most suits their needs. The inclusion of disruption messages alongside real time departure information adds to the acceptance of public transport services. More visual presentations of information would benefit some users, while others will require information to be accessible in other ways such as speech.
- Even without real time capability, enhanced electronic information systems have the potential to improve the acceptability of public transport as an option for many trips in Norwich and Norfolk.
- As well as technical challenges, there are commercial, organisational, and behavioural barriers to the successful development of working real time systems, which must be addressed as part of future projects (see ‘Transferability’).

Recommendations

- Recommendation 1 – The results of this evaluation should be used to scope further development of electronic passenger information (EPI) systems in Norfolk, including:
  - Developing an automated process for posting journey-specific disruption messages, based on predictions within the BUSNET system.
  - Providing all Norfolk-based bus operators with access to the Disruption Manager module, so service cancellations can be posted and disseminated in real time.
  - Providing individual operators with a capability to post general disruption messages.
  - Expanding the number of sites where EPI displays are hosted. City centre shopping malls and the University of East Anglia are obvious locations to explore for the first phase of expansion, alongside other large employers. Potentially market towns in Norfolk could be included for longer distance bus routes.
  - Considering the needs of groups with visual or other impairments who may have difficulty accessing real time updates via displays or SMS messages.
  - Developing the SMS message service to provide public transport users with real time service disruption messages as well as next departure information
  - Providing links with employers’ intranet sites to give tailored travel information including real time passenger information.
  - Re-configuring route destination descriptions to ensure that key destinations are flagged for users who are unfamiliar with local geography.
  - Recognising and understanding the potential for better information to improve public perception of security while using public transport.
- Recommendation 2 – Consider how new sources of revenue funding can be made available to support public transport information services. This trial revealed that employers and other organisations are very strong stakeholders in the movement to provide their staff and customers with the best possible information about travel to and from their sites.

- Recommendation 3 – Consider how public transport information can be blended with other travel information to support the choice of public transport as a convenient, safe and clean option for journeys in Norwich and Norfolk, as well as to promote awareness with the wider public.

Transferability

There appears to be reasonably good scope for transferring this measure elsewhere. Other cities may wish to pay particular attention to technical and information requirements.

Components relevant to transferability of measure 12.9	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Stakeholders' involvement				
	Bus operators and organisations hosting or having potential to host electronic display screens	High	1	The measure involved collaboration with local bus operators and organisations which had the potential to host electronic screens to display real time passenger information. Bus operators and 'hosts' were generally supportive of the measure. In other cities, public transport operators may be interested because of the potential benefits of reduced journey times, and improved perception and use of public transport. Other cities interested in this measure may need to promote the benefits and/or make a business case to public transport operators to help secure their co-operation. Also, organisations that have travel plans may be particularly interested in participating in real time information projects, e.g. hosting screens to display information and travel plan baseline surveys could be used to collect data about requirements for real time information.
	Supplier of IT systems	High	0	Provision of real time passenger information involved data transfer between various points. The proposed supplier had already provided Norfolk County Council with a bus tracking system, but it was not possible to reach an agreement with them regarding linking different systems. An alternative measure offering more limited passenger information was developed with another supplier. Negotiations with the original supplier were revisited and concluded successfully. This meant that the measure could be delivered as originally planned, but it was significantly delayed. It may be particularly useful for other cities contemplating this measure to draw on the advice and experience of the measure leader on a) negotiating with commercial IT suppliers and b) associated technical and information requirements (see also below).
Legal Requirements				
	Planning conditions	Medium	0	It was intended to trial provision of real time information within a new housing development. However, it was concluded that it was difficult to implement this within the current planning system. It is hard to assess the implications for transferability as this will depend on the nature of planning requirements in other

Components relevant to transferability of measure 12.9	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				countries.
Technical and information requirements				
		High	0	Databases of live traffic information were already available to Norfolk County Council, which could be utilised within the measure. However, technical problems were experienced during implementation, including problems with data transfer between different data systems. As a result the information provided is more limited than originally envisaged, consisting of scheduled bus departure information and service disruption messages via electronic display boards or texts to mobile telephones, rather than real time departure information. As noted under 'Stakeholders involvement', following further development, it was subsequently possible to implement the measure as initially planned and this is ongoing. If other cities interested in this measure have existing traffic databases available to them, they should consider whether/how they can be integrated with a real time information system.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration:	6 years				
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	7,188	0	0	-7,188	-7,188
Year 2	7,585	0	0	-7,585	-14,773
Year 3	65,596	0	0	-65,596	-80,369
Year 4	29,476	8,713	0	-38,189	-118,558
Year 5	0	0	0	0	-118,558
Year 6	0	0	0	0	-118,558
Total	109,845.19	8,712.83	0.00	-118,558	
NPV	98876	7593	0	-106469	
Average net present annual cost				-17745	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	139136	11036	0	-150172
NPV	125242	9617	0	-134860
Average net present annual cost				-22477

Due to difficulties in implementing the technical elements of the original plan this measure developed into a test of information structures and awareness and acceptance of the new services that are possible. This has not been implemented at a scale where quantifiable benefit has been achieved or can be estimated in a meaningful way.

3.3 Tallinn

3.3.1 Measure 12.5: Public Transport Priority System & Measure 12.6: Automatic Stop Calls and Information-Signs in Public Transport Vehicles

The two measures “Public transport priority system in Tallinn” (12.5) and “Automatic stop calls and information signs in vehicle” (12.6) share the same objectives. Measure 12.5 involves the upgrading of basic infrastructure and measure 12.6 involves the support to PT quality as it is important from the aspect of both visual and the quality of the information dissemination, but does not decrease travel times either transport mode. Because of this they have been evaluated together as a cluster because many of the impacts are difficult to separate.

The general goal of the measures was to interrupt the decline in the use of collective passenger transport services in Tallinn and prevent further decrease through increasing the efficiency and speed and improving the image of the collective passenger transport system in Tallinn. This linked to a secondary goal is to decrease the car traffic and congestion in the city centre and to reduce use of fossil fuels and emissions to the air.

Key Results

The key results were as follows:

- The most obvious direct result was a reversal of the speed decrease on SMILE routes for trolleybuses - the 2008 value is 2 km/h is higher on evening peak hour compared with the business as usual scenario and comparable with the value from 2005. At the same time the car speed on same route was decreased by 11.2 km/h compared with 2005. The reasons for the reduction in car speed are based on real car traffic growth for one hand, as well as the increased use of bus lanes, which causes a decrease in a number of car lanes in certain cross sections.
- The previous steady decline in the modal share of public transport (in terms of passenger kilometres) has been halted in 2008. However, the measures implemented have not managed a significant reverse in the trend – merely to hold the modal share at the same level as 2007.
- Increased level of satisfaction with the information of public transport users from 35% to 60%. This objective is almost completely fulfilled.
- To improve the attractiveness of public transport system through improved passenger information is fulfilled. Interview results showed that PT users generally approved of it. Interviewed people considered this measure to be very effective, although there was also evidence that the measure led to polarised views as to whether the measure was effective or not.
- In December 2007 the EU financed project "Public Transport Systems' Accessibility for People with Disabilities in Europe" finished. Estonia took part in this project. The interviewed people from various different organizations estimated that the accessibility of public transport passenger information is good in Tallinn. Overall opinion was that this measure should increase PT usage by disabled people, especially inhabitants with visual and hearing impairments. However, currently there is no evidence of disabled people PT usage before the measure implementation or today.

Recommendations

- Recommendation 1 – Better preparation for future similar project applications is very important in order to guarantee the introduction of all planned activities to time and budget. The first stage in this process involves better knowledge and understanding of the required public procurement processes, which if not followed properly can lead to challenges and delays.
- Recommendation 2 – Linked to recommendation 1 is the need to have better technical knowledge of the technical solutions to be implemented. This applies to the in house knowledge of the contracting organisation (in this case Tallinn City Council) which is necessary to ensure the appropriate level of technical specification within the tender documentation and subsequent project scheduling and contract management. Linked to this is a need to ensure that the tender is let to companies that can clearly prove technical expertise. In order to help with this there is currently a need in Estonia for greater involvement of international experts who could advise on the technical specification, management and selection of contractors. In hindsight this process

would have worked better if a shortlist of appropriate international contractors, with background and experiences for this type of project, prior to the tender being published.

- Recommendation 3 – Supplying PT vehicles with automatic stop calls and information signs is part of the measures, insuring better level of PT service. It should be complemented with loudspeakers on the outside of vehicles which will give to the people with visual impairments information about the line number and running direction of arrived vehicles.
- Recommendation 4 – Looking back, it was not a good idea to fit the new equipment to all old vehicles as some of them will soon be removed from service because of their age, so requiring the equipment to be removed and then fitted to future, new vehicles (if possible, as the vehicle supplier may wish to supply the vehicles with their own standard, comparable equipment as standard).
- Recommendation 5 – It is very important to fix all duties and tasks of project managers already during the first stages of the project as well as agree the tasks and duties of different partners including deadlines. General working tables should be created for the data in order to avoid later problems.

Transferability

These measures have potential for transferability as the opportunities exist to learn from positive experiences of public transport priority measures in Europe. When considering such measures cities need to look at the established practices of public transport priority measures to learn from their experiences and to see and appreciate their wider benefits.

Components relevant to transferability of measures 12.5 & 12.6	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Strategy for the future public transport priority system	High	0	This strategy was prepared around the desire for an open, centrally managed priority system that can be further developed into a real time management and control system for public transport. Development of the strategy needs to consider identifying and analysing specific problems which affect public transport journeys to then offer appropriate solutions for effective priority measures. It is important to have a clearly defined strategy when implementing public transport priority measures and therefore this characteristic is transferable and its development needs to be encouraged by public transport authorities and supported by appropriate technical experts and strategists.
Services Offered				
	Priority system for buses and trolley buses	High	0	The major operational project goal was to develop, demonstrate and assess an innovative set of integrated transport measures which together comprise the establishment of a priority system for buses and trolley-buses in order to increase the modal share of collective passenger transport. At least 384 vehicles in the Tallinn public transport fleet are provided with electronic displays and equipment for automatic stop-calls. The solution for implementing this should also offer the possibility to add real-time passenger information system in the near future. Electronic displays and equipment for automatic stop-calls have been installed in order to substantially raise the quality of public transport in a straightforward and cost effective manner. The same technical solution (hardware and software) has been used for all public transport modes within the city (bus, tram and trolleybus). It is important to note that implementation of the priority system was linked to the road construction plan, while construction projects had to observe the requirements of the priority system. This suggests a reliance of public transport priority measures on the infrastructure development with the benefits of priority measures being realised when both systems are implemented and perform well together.

Components relevant to transferability of measures 12.5 & 12.6	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				Passenger information on public transport is widely used in many European cities. To make public transport more attractive to potential users this characteristic needs to be promoted where possible.
Target Population				
	Public transport users	High	0	According to the measure information on the database, public transport users are the main target population for both measures. However, since both measures are trying to improve the attractiveness and image of public transport and reverse the decline of public transport usage car drivers should also be seen as a relevant user group to achieve modal switch and its associated benefits. With coordinated market approach this characteristic has potential for transferability. Also, it would be worth establishing further reasons of why people might choose to travel on public transport and their travel needs. This will help create an understanding of the measure effectiveness and enable future planning of the scheme in ways to ensure its success.
Geographical Area Covered				
	12.5: About 10 km PT lane in Tallinn 12.6: 426 buses, trolley-buses and trams operating throughout the city	High High	1 1	The streets and junctions for this measure were chosen according to their need for priority measures. This involves implementation of electronic displays and equipment for automatic stop-calls on public transport. These characteristics are transferable to any city willing to introduce public transport priority measures in a similar context and where there is political support available and resources to introduce such service.
Finances				
	Investment costs	High	-1	Investment costs for 12.5 are the costs of priority systems on 26 intersections, on 111 vehicles and 7 managing and observing centres. Investment costs for 12.6 are the costs of automatic stop calls and electronic displays in vehicles

Components relevant to transferability of measures 12.5 & 12.6	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				This characteristic is transferable as there will be significant costs associated with establishing and running of such scheme. It may be worthwhile for cities which plan such scheme seeking funding similar to SMILE project. The costs may differ depending on the system requirements and existing infrastructure.
Stakeholders' Involvement				
	Tallinn Transport Department Public transport operators (TAK, TTTK and MRP) The main technical contractor	High	0	Tallinn Transport Department played the leading role throughout the CIVITAS SMILE process. TAK, TTTK and MRP are the principal participants as they are the operators of the public transport vehicles in which the systems have been installed. The main contractor selected through the tender process turned out to be a disappointing choice, because in spite of previous corporate experience the chosen contractor did not have enough technical knowledge to carry out the tasks of the project to time and budget. It is important for projects to have the support from the public transport authorities and providers as well as a strong technical team to ensure their successful implementation. Transferability has potential where co-ordination between all relevant stakeholders exists and where there are available resources to introduce and implement similar projects.
Legal or Contractual Requirements				
	Contracts	High	1	Contracts were set up between Tallinn Transport Department and a subcontractor to provide the necessary support services. Transferability exists where such contractual arrangements need to be in place for successful running of the project.

Components relevant to transferability of measures 12.5 & 12.6	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Organisational or Institutional Aspects				
	Structure	Medium	0	Some subcontractors were not able to deliver the activities to the planned timetable and as required. It is important to have a strong organization and sufficient staff recourses particularly when subcontracting technical skills. A concept like this is transferable but does not necessarily have to be the same. When planning similar projects the cities can decide what management and operational structure would suit them best to achieve the successful implementation and running of the project.
Awareness and Communication				
	Awareness and acceptance for measure 12.5 Awareness and acceptance for measure 12.6	High	0	Complete awareness of 12.5 has risen by 32%. In 2005 fewer than 1/5 of citizens interviewed were completely aware of the measure. By 2008 this had increased to half of respondents. However, it seems that it is those who had a partial knowledge of the system who have become aware, and there is no evidence of a change amongst those who do not know of the bus priority system. Acceptance level has risen by 35.5%, which is a very good result. It is also evident that the level of very high antagonism to the bus priority rose between 2005 and 2008 which could be a result of a negative impact on car users on the priority route. Complete awareness of 12.6 has risen by 8.7%, but at the same time proportion of the passengers who had no knowledge of the measure rose too, which is surprising and hard to explain. Acceptance level has risen by 32.4%, which is a good result. It is also evident the level of very high antagonism to the stop calls and information system between 2005 and 2008 which could be a result of raised expectations which have not been satisfied among a proportion of the population. From these results you can conclude that public transport priority measures

Components relevant to transferability of measures 12.5 & 12.6	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				require educating car drivers of their importance and changing car drivers' perception of public transport. Well planned marketing and consultation exercises are essential, and can raise the level of awareness amongst population. Media can also act as powerful marketing tool by broadcasting positive messages about public transport priority measures and their wider environmental and health benefits to attract people's attention and increase awareness.
Wider Issues				
	Culture / lifestyle	Low	0	According to the measure template the planning and implementation of public transport priority measures in Tallinn has been affected by problems with procurement, lack of technical expertise and political support. Public transport priority measures are an important element of a successful public transport service. In societies where there is a strong reliance on a private car these measure require positive marketing approach to achieve a change of public perception as well as gain political support.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 12 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	69,351,356	12,000	0	-69,363,356	-69,363,356
Year 2	0	12,000	0	-12,000	-69,375,356
Year 3	0	12,000	0	-12,000	-69,387,356
Year 4	0	942,000	0	-942,000	-70,329,356
Year 5	0	942,000	0	-942,000	-71,271,356
Year 6	0	942,000	0	-942,000	-72,213,356
Year 7	0	942,000	0	-942,000	-73,155,356
Year 8	0	942,000	0	-942,000	-74,097,356
Year 9	0	942,000	0	-942,000	-75,039,356
Year 10	0	942,000	0	-942,000	-75,981,356
Year 11	0	942,000	0	-942,000	-76,923,356
Year 12	0	942,000	0	-942,000	-77,865,356
Total	69351356	8514000	0	-77,865,356	
NPV	67006141	6497339	0	-73503480	
Average net present annual cost				-6125290	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	6128881	752419	0	-6881301
NPV	5921624	574198	0	-6495823
Average net present annual cost				-541319

It has not been possible to isolate the impacts of this measure in terms of energy and emissions due to the range of other factors that have been active in Tallinn during the course of this implementation. Hence no cost effectiveness value is calculated for this measure.

3.4 Potenza

3.4.1 Measure 5.5: Introduce Clean Vehicles in a Large Fleet of Urban Buses

The local administration Potenza has been involved in developing many actions regarding sustainable mobility, such as an integrated management of the public transport system, the design of a new and more efficient public transport system, the realization of new parking areas at the border of the historical centre.

This measure has involved the purchase and implementation of four CNG buses have been introduced in the public transport fleet, with the expectation that they will be energy-efficient, cost-effective and clean vehicle fleets for public use. In the initial workplan it was expected that some of the buses would have been used for the implementation of a Dial-a-Ride system operating on routes linking external districts to the town centre (SMILE measure 8.7). However, because of the delays presented in the implementation of the Dial-a-Ride system, the new buses are being used only for the ordinary public transport routes.

Key Results

The key results, which are largely based on a desk-study rather than in-service measurements due to late delivery of the measure, were as follows:

- An annual reduction of fuel costs of € 30.358 by virtue of using new CNG vehicles rather than existing diesel vehicles.
- A reduction of 171 kg in hydrocarbon emissions per year, or 81%, by virtue of using new CNG vehicles rather than existing diesel vehicles.
- A reduction of 461 kg in carbon monoxide emissions per year, or 44%, by virtue of using new CNG vehicles rather than existing diesel vehicles.
- A reduction of 3933 kg in NOx emissions per year, or 94.5%, by virtue of using new CNG vehicles rather than existing diesel vehicles.
- A reduction of 63 kg in particulate emissions per year, or 77%, by virtue of using new CNG vehicles rather than existing diesel vehicles.
- An increase of 40.3 tonnes in carbon dioxide emissions per year, or 12.5%, by virtue of using new CNG vehicles rather than existing diesel vehicles.

Recommendations

- Recommendation 1 – This kind of activity (procurement of public goods or services) can take a long time to be concluded. Therefore, in order to include it in a limited-duration project, all necessary steps have to be accurately planned and all relevant subjects have to be identified since the very first steps and moments of the project beginning. The city of Potenza have learnt how to accelerate all stages by modifying internal procedures, better specification of technical requirements and how they relate to vehicle availability on the open market and by generating a better understanding of the European tender rules. Other cities and vehicle operators need to ensure that they are properly prepared in this way for non-standard orders linked to new technology vehicles.

- Recommendation 2 – The evaluation of this measure has been limited by late delivery in relation to the SMILE contract period. It is recommended that other cities try to base their decisions on real operational experiences rather than desktop studies if at all possible.
- Recommendation 3 – The use of CNG rather than diesel changes the balance of pollutants that result from vehicle use. Local authorities need to consider what their priorities are. The use of biogas, as in measure 5.3 in Malmö would more than offset the increase in point of use emissions CO_2 identified in the evaluation of this measure as it stands.

Transferability

This measure is highly transferable due to the desire of many cities and operators to reduce the impact in terms of emissions from public transport, both as a direct consequence of upgrading the vehicles, and also as part of a package of measures to induce a modal shift to public transport by improving the quality of the service offered.

Components relevant to transferability of measures 5.5	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Strategy for the future public transport priority system	High	2	This measure links directly into Potenza's strategy to upgrade the public transport offer in the town and surrounding region and is typical of the aspirations of many other public authorities across Europe.
Target Population				
	Public transport users	Medium	1	The direct expectation is that the CNG vehicles themselves will provide improved environmental performance in comparison with the existing diesel vehicles. However, a secondary expectation would be that by improving the services offered and backing the improvement by marketing and mobility management services then a significant modal shift by users could be achieved that would result in a further improvement in environmental performance in terms of emissions per passenger carried and overall emissions across all modes
Geographical Area Covered				
	Small city and local region	High	0	Potenza is a relatively small city with a disperse regional catchment area. Public transport services in the area have not traditionally been well used, which means that the initial investment in CNG vehicles has been in vehicles that would probably be smaller than would be considered useful in many larger cities where public transport ridership is greater.
Finances				
	Investment costs Operating (fuel) costs	High High	-1 0	Investment costs for vehicles, particularly for small orders of non-standard vehicles, can be high and act as a barrier in comparison with the purchase of standard vehicles. The fuel cost savings from operation provide an opportunity in Potenza to offset the initial purchase cost over the life of the vehicle, providing appropriate whole life costing methods are used in the selection process. The fuel cost benefit is dependent upon the taxation regime at national level and may not be the same in all countries in the EC.

Components relevant to transferability of measures 5.5	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Legal or Contractual Requirements				
	Procurement procedures and contracts	High	0	Issues around procurement regulations and contract requirements have caused problems not only on this measure in Potenza but also on other SMILE measures in one-off procurements by public authorities that are not used to the process.
Organisational or Institutional Aspects				
	Structure of public transport provision	Medium	0	The arrangements for the provision of public transport services have an influence on the procurement processes that need to be followed, and in situations where private sector organisation provide services under contract then the procurement regulations may be eased compared to the current situation where it has been the public authority that has been responsible for procurement.
Awareness and Communication				
	Marketing	Medium	0	Because the technical implementation occurred late in SMILE contract terms there was little time for marketing of the new vehicles. However, in order to capture the full benefit it should be a core component when considering this type of implementation in other locations.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 11 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	4,722	0	0	-4,722	-4,722
Year 2	18,265	0	0	-18,265	-22,987
Year 3	104,092	0	0	-104,092	-127,079
Year 4	0	0	30,358	30,358	-96,721
Year 5	0	0	30,358	30,358	-66,363
Year 6	0	0	30,358	30,358	-36,005
Year 7	0	0	30,358	30,358	-5,647
Year 8	0	0	30,358	30,358	24,711
Year 9	0	0	30,358	30,358	55,069
Year 10	0	0	30,358	30,358	85,427
Year 11	0	0	30,358	30,358	115,785
Total	127079	0	242864	115,785	
NPV	115498	0	188217	72719	
Average net present annual cost				6611	

Adjusted, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	147595	0	282072	134477
NPV	134144	0	218603	84459
Average net present annual cost				7678

The annualised financial balance over the lifetime of the measure, based on this desk-based analysis using manufacturer's data shows a reduction in costs as a result of the reduction in annual fuel costs.

Given that the CO_2 balance of the measure using CNG appears to be negative based on the manufacturer's own data it does not make sense to include this under a heading of cost effectiveness. However, for the record there would be a reduction in annualised cost of €190.5 per tonne increase in CO_2 emissions.

For the other, local, pollutants the cost effectiveness values based on the desk study data are:

- Hydrocarbons: -€ 44.9 per kg
- CO: - -€ 16.7 per kg
- NOx: -€ 1.95 per kg
- Particulates: -€ 121.9 per kg

The minus sign indicates that there is a cost reduction associated with each of these emissions reductions.

3.4.2 Measure 8.7: Demand Responsive Transport System

Given the particular configuration of mobility and population within the municipality of Potenza (creating a disperse mobility demand for links between the historical centre and the suburban zones), the local project partners that were responsible for public transport provision decided to implement a public “Dial a Ride” (or more formally a Demand Responsive Transport [DRT]) service to serve the Province of Potenza, with a demonstration carried out in the peri-urban zone of the municipality.

The original implementation partner left the consortium and was replaced during 2007, i.e. halfway through the four year project. This resulted in a change of location and a fresh start to the process of service definition in a new location, which led to many significant delays.

Even once the research phase was complete the local measure leader had some difficulties in preparing the software for the start of the implementation. The fact that this measure progressed so far was due to the commitment of the local authority to DRTS as a key component part of their strategy to improve the public transport offer in the Potenza area.

Key Results

- Demand Responsive services, in Italy at least, are far from economic in terms of the balance between service costs and revenues received. Although the modelled results are still to be tested in practice, the local authority fully expects to subsidise the service to the tune of €100,000 per year, which is normal for local authorities in Italy as a contribution to the basic mobility provision to peripheral and low population density areas, but would be hard to justify in many situations and political structures.

Recommendations

- Recommendation 1 - the partner(s) in charge of the implementation of a DRT service must be responsible for public transport in the town because it must have full awareness of the context it is going to act in, of its features and its needs, in order to achieve the maximum efficiency in the service offer and control of the integration between DRT and regular public transport services.
- Recommendation 2 – it is very important to involve in the preparation phase (design of the service) the target and potential users in different ways and methodologies (e.g. through a customer satisfaction survey)
- Recommendation 3 – a DRT service, that can be considered a strategic action within the management of a mobility system, must be pursued despite any barrier or difficulty
- Recommendation 4 – public subsidy of public transport services in remote and rural areas which are not economically viable can become part of the transport policy to promote social inclusivity and accessibility.
- Recommendation 5 – in combination with DRTS in remote areas, it is recommended to increase the frequency of existing services to reduce waiting time.
- Recommendation 6 –it is recommended to promote joint working between different operators, where possible, to achieve better integration and synchronization of different services which will benefit existing commuters and help attract car users to create modal shift.

Transferability

Although the circumstances in which a demand responsive service would be contribute to the public transport service are common, it requires a significant commitment on the part of the organisation responsible for funding to support such services. For this to be viable there needs to be strong political support, as confirmed by the public transport strategy in place and available budget. In many situations this will not be economically feasible or politically acceptable.

Components relevant to transferability of measure 8.7	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Public transport policy Accessibility policy	High Medium	-2 0	DRT services are appropriate in certain specific circumstances, such as in Potenza, where there is a combination of unfulfilled demand for mobility which cannot be satisfied by conventional public transport and other alternatives, including private transport, are inappropriate for various reasons, including economic and social accessibility reasons. In Potenza the public transport policy has recently been developed specifically to envisage DRTS as a component part of the public transport service offer. This is a key driver for the local project in Potenza and is in line with many other similar areas in Italy. However, the factors covered in the rest of this transferability assessment will show that this measure is not universally transferable to other locations.
Target Population				
	General population, but targeting specific groups	Medium	0	Most of present users of the rural public transport are students. The intention is to expand the user base through the DRT service. As a result the DRT service was defined on the basis of an analysis of the population distribution and transport needs in the experimentation area, focusing on areas where there are clear gaps in service provision by virtue of time or location and where economic conditions also restrict people's mobility.
Geographical Area Covered				
	Wider region	High	0	The Municipal area of Potenza is large and the population is not equally distributed. (It is concentrated in central areas where most activities are located and the accessibility to services is better.) Many of the areas around the city are nearly uninhabited, with the villages characterised by low population density, population dispersion and low mobility levels. This type of distribution is one that is not suited for conventional public transport services, and so a DRTS is appropriate if these areas are to be included within the

Components relevant to transferability of measure 8.7	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				social and mobility policy of the area in an equitable way.
Finances				
	Operating subsidy	High	-2	The estimated level of operating summary is significant based on relatively low income from service use in the low population target area. This is justified in the case of Potenza because the service is viewed as a critical element of the regional public transport and accessibility strategies, but this would not be viewed as economically acceptable in many places.
Stakeholders' Involvement				
	Public authorities Public transport operators	High	-1	The service is prioitised by the local authority and delivered under contract by one of the local public transport providers. Both organisations need to be fully committed to this, with the necessary level of co-ordination going into the service planning in order to ensure coherence with the other public transport services in the area.
Organisational or Institutional Aspects				
	Administrative structure	High	1	Clear responsibility for setting and delivering public transport policy and the related services is important to the structuring of this DRTS measure. Locations where there is a more open market approach to the provision of public transport would make this approach difficult to deliver in a coherent manner.
Technical Requirements				
	Software Information & communications	Low	+2	Control of the bookings and monitoring the status of the service in meeting the customer requests placed upon it is an important element of ensuring that the service is successful from a customer's point of view. Such software is not uncommon, but still needs to be tested and this element led to problems which resulted in delays in Potenza when the services finally reached the implementation phase.

Components relevant to transferability of measure 8.7	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Awareness and Communication				
	Publicity and public relations User communications	High	+1	The concept of a DRT service requires good customer awareness in order to achieve decent levels of patronage. This will require significant effort in terms of explanatory information and efforts to engage with potential users in what is by definition a difficult area in order to raise accurate awareness of the service and how it works.
Wider Issues				
	Culture / lifestyle	Low	0	The attitude to car use and the degree to which car ownership and other forms of mobility are embedded within the local culture and lifestyle may be a barrier to success in some locations

Costs, Revenues and Cost Effectiveness

Costs are associated with various elements of the project, including:

- Background research of comparable systems.
- Market research
- System specification
- System development and testing
- Marketing
- Operation
- Subsidy
- Revenues from passengers

The measure leader has estimated the annual operating costs and revenues to provide an ongoing imbalance of around €100,000 per year for the one DRT service. When considered in addition to the set up costs then this measure has a significant financial commitment attached on an going basis. Fortunately the management software and maintenance is currently free of charge.

Because the project implementation was delayed and only the planning was in place by the project end there are no confirmed impacts against which to compare the costs as part of an assessment exercise.

3.4.3 Measure 9.3: Development of a Car Pooling

“Car pooling” means two or more people who share origin, destination and travel at similar times during the day deciding to form a “crew” using a car owned by one of them to share journey and parking costs. (This is also known as lift-sharing and car sharing in some countries.) Even if collective use of a car is a reality in many companies and organisations, including in Potenza, it derives from informal, spontaneous rather than organised initiatives, leading to modest results in terms of journey reductions. This measure is aimed at delivering and an operating centre equipped with specific software able to manage databases and create “ideal crews” with a view to increasing vehicle occupancy, reducing the number of circulating vehicles and reducing the resultant emissions.

Key Results

The key results are largely based on market research into the potential of the measure due to the late delivery of the measure and the fact that experience from other cities suggests that a period of 1-2 years is necessary for people to test the system and build confidence in it to make it part of their normal mobility pattern, were as follows:

- useful data to understand baseline car use has been collected:
  - 69.4% travel alone by car;
  - 8.6% travel by car as a driver (2 people/vehicle);
  - 11.5% travel by car as a passenger (2 people/vehicle).
- useful data to understand the acceptance level has been collected:
  - 31% of people would accept to participate at the car pooling service and pay for it;

- 29% of people would accept to participate at the car pooling service only for free;
- 33% of people would not accept to participate at the car pooling service.

Recommendations

- Recommendation 1 - Such a service must be activated with deep surveys on potential users' needs and requires long time of activation. The evaluation must be performed on a very long period.
- Recommendation 2 – Importance of dissemination and sensitizing activities to potential users
- Recommendation 3 – The system must be considered not as a solution to mobility problems of a company, but must be seen only as a part of a more complex system of initiatives and activities.
- Recommendation 4 – External stakeholders must be involved in the definition of car poolers incentives, i.e. the local public transport operator can help in the increase of public transport means use and the improvement of the service level
- Recommendation 5 – Marketing and promotion campaigns to raise awareness amongst employees of new companies which join the scheme.
- Recommendation 6 – It is worth considering a wider application of this measure to involve participation from general public in Potenza. This could be achieved by co-ordinated marketing and promotion of benefits of car sharing.
- Recommendation 7 – To gauge the success of a measure its objectives need to be tangible, achievable and measurable. It is recommended that the objectives are properly researched prior the start of the project to meet the project requirements and enable the evaluation process to correctly measure their achievements and overall success of the project.

Transferability

This measure is highly transferable due to the desire of many cities and operators to reduce the number of single occupancy car commuting trips that contribute to congestion and emissions in the urban environment.

Components relevant to transferability of measures 9.3	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Strategy for the urban transport system	High	2	This measure links directly into Potenza's strategy to address the number of single occupancy car commuting trips that contribute to congestion and emissions in the urban environment and is typical of the aspirations of many other public authorities across Europe.
Target Population				
	General public	High	0	Car users within the general public are not always receptive to attempts to change their behaviour and such activities seed to be backed up by research and supporting activities such as marketing campaigns and incentives
Geographical Area Covered				
	Small city and local region	High	0	Potenza is a relatively small city with a disperse regional catchment area. There are both positive and negative aspects to this as it increases the chances that commuting journeys will end in Potenza, but reduces the chance of closely originating trips in the rural area around the town.
Finances				
	Investment costs	Low	2	Potenza decided invest in modifying an existing system, which took time and extra financial resource. This was in part due to the nature of the city and the implementation and other locations may find it easier to use an 'off the shelf' package.
Awareness and Communication				
	Marketing	High	0	Marketing support is an important element in helping this type of measure to succeed. It is often found that the marketing elements of such measures are not well resourced, which actually reduces the effectiveness of the main investment

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 7 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	36,965	0	0	-36,965	-36,965
Year 2	2,500	0	0	-2,500	-39,465
Year 3	2,500	0	0	-2,500	-41,965
Year 4	2,500	0	0	-2,500	-44,465
Year 5	2,500	0	0	-2,500	-46,965
Year 6	2,500	0	0	-2,500	-49,465
Year 7	2,500	0	0	-2,500	-51,965
Total	51965	0	0	-51,965	
NPV	48586	0	0	-48586	
Average net present annual cost				-6941	

Adjusted, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	60354	0	0	-60354
NPV	56430	0	0	-56430
Average net present annual cost				-8061

The impact of the car pooling measure on energy use and emissions is not yet fully understood as the impacts of the measure will take some time to be felt fully. However, the cost table shows that this measure has been achieved at a relatively low cost in both absolute terms and over an initial seven year lifespan.

3.4.4 Measure 11.6: Mobility Centre

Implementation of ‘soft measures’ in Potenza involved all the local partners, although the project partnership was fundamentally reorganised halfway through the four year duration of the project, which led to a period of significant uncertainty and some delays in implementation.

The general aim of this measure was to promote sustainable mobility in Potenza site through the realization of different and strictly correlated tasks. The main focus was to create a mobility centre within the city so that the focus on sustainable mobility projects had an ongoing function after the end of the SMILE project. In addition to that there were further specific actions – both support actions and implementations – that occurred within the project period.

The mobility centre has two main functions:

- informing those people who live and/or work in Potenza about local mobility and proposing, organising and managing sustainable mobility related activities, in order to focus public opinion towards environmental problems;
- coordinating all the mobility management tasks implementation (such as creation of Mobility Offices, realization of Home to Work Mobility Plans, dissemination actions) to address the modal choice in favour of the use of public transport.

The Mobility Centre was initially established in a temporary location within the municipal buildings which a purpose-built office closer to the main bus and rail stations was constructed.

Following the creation of the Mobility Centre, four Mobility Offices were opened in the main organisations/firms within the municipal territory of Potenza. The main task of local Mobility Managers in each organisation was the rationalisation of employee behaviour and use of resources with the aim of producing new travel patterns which with lower (individual and global) costs will allow people to obtain more advantages from travelling in a sustainable manner. This involved the production of organisational Mobility Plans. The Mobility Plans concern commuting trips between home origin and work destination. Within the plans, information and comparison are provided about different alternatives available, in terms of journey times, monetary costs and environmental impact. Incentives and/or measures supporting “sustainable behaviours” have been adopted and new services (car pooling, in-company buses) have been organised.

Additionally, the population has been involved in demonstration activities through an awareness and education campaign. Starting from the second year of the project, conferences, workshops and events were organised (at least one in each year) to involve the public in the sustainable themes and actions foreseen within SMILE.

Key Results

The key results are as follows (remembering that the measures were implemented during the second half of the project period and are generally of a support, rather than a direct implementation nature):

- establishment of the Mobility Centre in its permanent location
- mature understanding of potential availability of organizations employees in using pt vehicles (whereas the service is improved)
- understanding of potential benefits of actions in terms of: economy, environment, transport, society

Recommendations

- Recommendation 1 - Need of involvement of all stakeholders, both those directly involved in the transport and those who can influence all policies related to transport.
- Recommendation 2 – The focus on Mobility Management gives the opportunity of rationalising all policies related to the urban structure (land use planning).
- Recommendation 3 – Importance of coordination between the political representatives and technical officers of all public/private companies involved.
- Recommendation 4 – Importance of awareness campaigns to change habits related to transport in the town.

Transferability

This concept is highly transferable, although there are some key lessons to be learned about how to go about implementation to ensure a successful outcome.

Components relevant to transferability of measure 11.6	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Public transport and accessibility policies	High	2	This measure links directly into Potenza's strategy to upgrade the public transport offer in the town and surrounding region and reduce the number of single occupancy car commuting trips that contribute to congestion and emissions in the urban environment. It is an high-level measure that in addition to having its own implementation elements, supports the other measures within SMILE that were implemented in Potenza. There is no doubt that the delays in finishing the purpose-built offices for the Mobility Centre and recruiting the full-time mobility manager had knock-on impacts elsewhere within the programme.
Services Offered				
	Mobility Centre and mobility management support	High	2	The concept of a Mobility Centre is important and although quite common in some Northern European countries, it is no so well known in the south. It is an important step to show the importance being placed on sustainable mobility by the local municipality, but does not, on its own, guarantee success. It will need ongoing political support, research and implementation budget, plus backing from other related policies if it is to succeed.
Geographical Area Covered				
	City and surrounding region	High	2	Importantly, the mobility centre is covering both the relatively small city area and the much wider region around Potenza which provides much of the population who use Potenza as a work / shopping destination. This results from the co-operation of both the city and regional authorities recognizing that this sort of joint policy is essential
Finances				
	Capital costs	Medium	2	The capital cost of building the Mobility Centre has been relatively small as it will be housed in only a small part of a much larger development.

Components relevant to transferability of measure 11.6	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
	Running costs	High	-1	Taken over the long term life of a Mobility Centre, (which is essential if it is to have an impact on mobility patterns) the more significant cost will be the running costs associated with employing the staff and funding the interactions with businesses and the general public that will get the message out to those who make the trips. Without this funding there will be a risk that the Mobility Centre will be an ineffective capital investment. There are examples of this happening elsewhere. Success is dependent upon ongoing political support, as well as the Mobility Centre being able to justify its work through verified results, which is why ongoing research and evaluation budgets are important.
Human Resources				
	Mobility management staff in the Mobility Centre and the partner organisations	High	0	In addition to the point above about the importance of budget being available to fund the ongoing costs of employing the permanent staff of the Mobility Centre, it is also important to generate a team of people within each participating organisation each of whom actively takes ownership of the sustainable mobility activities within their company. These are people who are members of staff of the participating organisations and as such have a 'day job' that the sustainable travel activities then have to fit around. The success of the mobility centre is dependent on these people, the support they get from their employers, and their engagement and also on the marketing materials and messages that are available to them.
Stakeholders' Involvement				
	Public authorities Employers Public transport providers General population			In the preceding paragraphs it has been demonstrated that a wide range of organisations need to be fully engaged in the programme, as part of a long term plan, if a change in mobility culture is to be achieved. This will require each organisation to buy in to an overall strategy and then to deliver its part of the strategy. The strategy will need to establish the benefits for each organisation so that it can justify its involvement as well as the benefits for the general public so that changing their travel behaviour can be successfully promoted to them.

Components relevant to transferability of measure 11.6	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Organisational or institutional aspects				
	Administrative structures	High	+1	The structures and procedures of public administrations vary considerably across the European Union. This makes it difficult to be sure of transferability in terms of the specific procedure for setting up a collaborative structure such as a Mobility Centre. One common theme, however, is that whatever the specific nature of the public administration's procedures, it will probably be complex in nature. This is one reason why it took an unexpectedly long time to make the permanent appointment of the first member of staff for the Mobility Centre in Potenza.
Technical and information requirements				
	Publicity material	High	+1	The publicity materials that support the various general themes of the work carried out under the Mobility Centre need to be well researched to ensure that the message is credible to with the end users (i.e. general population) and then produced to a good quality. A clear distribution strategy then needs to be followed to ensure that these get to the various end users.
Awareness and communication				
	User communication	High	+1	As well as the work carried out through the member organisations on things such as company travel plans, the Mobility Centre is also responsible for general campaigns direct to the general public in the area to promote sustainable mobility to the wider population through general publicity events. This is helpful as, even if it does not drive travel behaviour directly, it helps to raise background awareness that is then exploited by the more targeted interventions at company level.
Wider Issues				
	Culture / lifestyle	High	+1	Potenza is close to the top of the list in Italy for car dependency and the use of car

Components relevant to transferability of measure 11.6	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
				for short trips. This is a reason why the situation in the city has prompted to municipality to take action. However, this situation makes it difficult to achieve results because car use is so strongly embedded into the mentality and habits of the people that they become unaware of the alternatives that are available to them.

Costs, Revenues and Cost Effectiveness

3.5 Suceava

3.5.1 Measure 5.6: Alternative Fuel Bus Fleet

Prior to the start of SMILE, public transport in Suceava was provided using old, pre-Euro buses and some Euro 2 minibuses. Even though some attempts to use particulate traps and other emission control devices had been take, the level of traffic pollution generated by public transport remained very high.

One major objective is therefore to increase the number of public transport vehicles using clean and renewable fuels, thus reducing the use of diesel and leading the way to a sustainable transport system. Suceava Municipality together with the public transport company initiated the implementation of a new public transport plan which included introduction of 15 new Euro 3 buses. This provided a good opportunity to reduce public transport pollution by starting the implementation of alternative fuel equipment on the buses. Gaseous fuels such as biogas and LPG offer the additional benefit of potentially reducing noise by 50 % and this is very important for the quality of life in the city.

This measure was divided into two stages: LPG buses were to be introduced in the first stage (by the end of 2007) and followed, if feasible, by the introduction of the biogas buses (concurrent with the development of biogas facilities) by the end of 2009. It was expected that introduction of biogas buses might be more difficult and would depend on several factors (e.g. bus manufacturers, biogas suppliers, local and national regulations). As it became clear that the biogas option could not be delivered within the project timescale the Local Transport Company increased the total number of LPG buses to 30, through the addition of 15 further new vehicles later in the project.

In parallel with this investment the organisation of the public transport was radically changed. Four of the identified new bus routes were redesignated as “Eco-routes” and have been operated, from the PT point of view, only by the clean buses belonging to LTC. The Eco-routes pass through the whole city, including residential areas.

Key Results

The key results are as follows (remembering that measure 8.9 was evaluated as part of a cluster with measures 8.8 and 8.9):

- In percentage terms the Euro 3 diesel buses were 16.7% less energy efficient in terms of MJ/km, than the original pre-Euro diesel buses (not allowing for any changes in occupancy, size or capacity) whilst the conversion to LPG led to a net improvement in energy efficiency on the same basis of 8%, again as compared to the original pre-Euro buses.
- The total reduction of CO_2 emissions per month, as a consequence of the conversion of 15 buses to LPG was 30937.5 kg CO_2. For one year, the total direct increase from the bus fleet is 371250 kg CO_2

- The total reduction of CO emissions per month, as a consequence of the conversion of 15 buses to LPG was 24.8 kg CO. For one year, the total direct increase from the bus fleet is 298 kg CO
- The total reduction of NOx emissions per month, as a consequence of the conversion of 15 buses to LPG was 513.6 kg NOx. For one year, the total direct increase from the bus fleet is 6163 kg NOx
- The total reduction of particulate emissions per month, as a consequence of the conversion of 15 buses to LPG was 32.2 kg PM_{10}. For one year, the total direct increase from the bus fleet is 386.4 kg PM_{10}
- People have been totally supportive of the implemented activities. Their number increased from 35.7% of the total number of people interviewed in 2006 to 55.6% in 2008 (i.e. more than half of the sample interviewed).
- With regard to public transport patronage data from 2005-2008 shows that there was an increase of 757% in passenger numbers. (July 2005 – March 2006: 73549 passengers / month, January 2008 – June 2008: 630144 passengers / month).
- improved quality of the PT service; all the quality service parameters have been assessed and the conclusions underlined the importance of these new features for the passengers (physical comfort, personal security, lines, trip duration, accessibility of PT vehicles within the bus stops, drivers' attitude, information network and real-time information).

Recommendations

- Recommendation 1 – To increase the use of LPG fuel into the public transport and to implement and develop the use of biogas fuel and distribution facilities.
- Recommendation 2 – If possible, to do this as part of a wider upgrade of public transport service structure, support facilities, information and marketing.

Transferability

This measure is highly transferable, particularly for cities in the New Member States for whom the political structure may be closer to that in Suceava.

Components relevant to transferability of measure 5.6	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Public transport policy	High	+2	Suceava Municipality reviewed its public transport strategy as part of the implementation of the cluster of measures 5.6/8.8/8.9 and this included recognition of the important role that information plays in supporting the development of public transport within the city. Prior to the implementation of the public transport strategy the provision of bus services was haphazard, hampered by confusion and provided by poor quality vehicles, which made the offer unappealing to the travellers in Suceava.
	Environmental policy	High	+2	The acknowledgement of the importance of improving air quality within the city was also a key driving force for this measure, and was reflected in the decision to use the public transport fleet as a demonstration tool in this way.
Geographical Area Covered				
	Routes / City Centre	High	+2	The purchase of new buses has happened on a scale that allowed almost all bus services in the city to be operated by new, clean vehicles. The rearrangement of the bus routes to focus on the main routes within the city centre area allowed the LPG buses to be focused in the same way, so making a very visible statement to the local citizens.
Finances				
	Capital costs of purchase	High	-1	The purchase of 30 new buses in Suceava was a significant investment that would not have been possible without the funding from the European Commission through SMILE. Prior to the project the public transport company's finances had been very poor and it was caught in a vicious circle of competition with cheap, flexible but unregulated private operators. The restructuring of public transport provision in the city to support the finances of the publicly owned public transport company was an essential element of this measure.
Stakeholders' Involvement				
	Municipality	High	0	The intervention of the municipality into the market in order to support the

Components relevant to transferability of measure 5.6	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
	Local Public transport company Fuel and technology suppliers			publicly owned public transport company was an essential element of this measure. In other countries where the structure of public transport provision is less closely allied to the municipality this approach could not be followed and different partnerships and mechanisms would need to be used to achieve the same outcome. Because LPG already had a foothold in the local market it made expansion easier. LPG is generally available across Europe, from all the major fuel suppliers as well as smaller commercial players, but the degree to which it is used is subject to local market and political conditions.
Organisational or Institutional Aspects				
	Administrative structure	High	0	The arrangement in Suceava, where the municipality has complete control over the whole road network and the planning and development system within the city as well as owning the public transport company, provides them with an unusual level of control over the various separate aspects that are linked together to deliver this measure. Such links are not generally present in other countries, which would make implementation more difficult.
Technical Requirements				
	Equipment, tools and information	High	+2	The municipality in Suceava had previously been involved in the demonstration of LPG cars as part of its own fleet and had been working with local companies to achieve this, meaning that the technical expertise had been encouraged and developed in the municipal area. As part of SMILE this process was continuing with support being provided for the conversion of other vehicles, particularly taxis and other fleet users in measure 5.7. Hence there was strong mutual political and technical support for this measure.
Awareness and communication				
	Publicity and public	High	+2	This measure was both the focus for local publicity, by using the public transport

Components relevant to transferability of measure 5.6	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
	relations			vehicles operating on LPG as a statement of good practice, and supported by various information and publicity actions that are the subject of other measures: • Measure 5.7 and the support given to LPG as a clean fuel • Measure 8.9 and the information provided to support the ecological bus routes • Measure 11.7 and the wider marketing conducted to support sustainable travel options.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration:	15 years				
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	37,528	0	0	-37,528	-37,528
Year 2	39,329	0	0	-39,329	-76,857
Year 3	1,642,112	0	0	-1,642,112	-1,718,969
Year 4	1,690,280	0	0	-1,690,280	-3,409,249
Year 5	0	0	0	0	-3,409,249
Year 6	0	0	0	0	-3,409,249
Year 7	0	0	0	0	-3,409,249
Year 8	0	0	0	0	-3,409,249
Year 9	0	0	0	0	-3,409,249
Year 10	0	0	0	0	-3,409,249
Year 11	0	0	0	0	-3,409,249
Year 12	0	0	0	0	-3,409,249
Year 13	0	0	0	0	-3,409,249
Year 14	0	0	0	0	-3,409,249
Year 15	0	0	0	0	-3,409,249
Total	3409249	0	0	-3,409,249	
NPV	3027045	0	0	-3027045	
Average net present annual cost				-201803	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	1722591	0	0	-1722591
NPV	1529475	0	0	-1529475
Average net present annual cost				-101965

The impact on pollutant emissions per annum from the purchase of new buses and conversion of the buses to LPG were as follows:

CO_2: reduction of 371.25 tonnes

CO: increase of 298 kg

NOx: reduction of 6163 kg

Particulates: reduction of 386.4 kg

The cost effectiveness values become:

CO_2: RON 543.6 per tonne or € 274.6 per tonne

CO: -RON 677.2 per kg or -€ 342.2 per kg

NOx: RON 32.7 per kg or € 16.5 per kg

Particulates: RON 522.3 per kg or € 263.9 per kg

3.5.2 Measure 5.7: Promotion of Alternative Fuels in the Public and Private Sector

The Municipality of Suceava has plans to produce biogas for use in transport applications following the upgrade of the local waste water treatment plant. Prior to SMILE the majority of transport in Suceava was conducted by old vehicles using conventional petrol and diesel fuel. As an intermediate step towards raising awareness and acceptance of biogas as the long term objective, Suceava municipality decided to promote the use of LPG, which already had a small foothold in the transport market. This was also expected to yield some environmental benefits within the city in the short term.

Key Results

The key results are as follows:

- An increase of the LPG fuelled taxis, both due to converted systems and launching new LPG fuelled vehicles onto the market in Suceava city and at the national level by 31.1% in 2008
- An increase of the LPG fuelled minibuses operating public transport by 5% by the end of 2008
- An increase of the LPG fuel sales, by 34.6% at the level of year 2007
- A decrease of the CO emissions measured at the tailpipe due to the LPG conversion of the gasoline fuelled taxis (37% better than gasoline and 29% worse than diesel on a vehicle by vehicle basis), leading to a 7% improvement for the taxi fleet as a whole in Suceava.
- A decrease of the CO_2 emissions and reduction of greenhouse gas emission due to the conversion LPG taxis (36% better than gasoline and 18% better than diesel on a vehicle by vehicle basis), leading to a 10% improvement across the taxi fleet as a whole in Suceava.
- Good local conditions for implementing the future clean vehicles - electric and hybrid vehicles - based on good knowledge and acceptability from the citizens
- Verification of the beneficial financial impact of operating vehicles on LPG as compared with conventional fossil fuels (100% better than gasoline and 40% better than diesel)
- Verification of the beneficial energy efficiency impact of operating vehicles on LPG as compared with conventional fossil fuels (15% better than gasoline and 1.8% better than diesel), leading to a 3.7% improvement for the taxi fleet as a whole in Suceava.

Recommendations

- Recommendation 1 – to continue to keep people informed continuously with regard to the possibilities and the steps ahead made by the alternative fuels

- Recommendation 2 – to continue deploying informing campaigns and to exploit the results from the project evaluation
- Recommendation 3 – to stay in touch with all the relevant public institutions and to encourage the concurrent efforts for changing citizens' mentalities with regard to vehicle fuels, urban mobility and healthy conditions of life in the city
- Recommendation 4 – to monitor the waste water treatment plant rehabilitation project and to build the foundation on which the biogas market can develop
- Recommendation 5 – to continue lobbying for local legal provisions to differentiate the taxation levels for alternative fuelled vehicles in comparison with regular fuelled vehicles
- Recommendation 6 – to continue promoting other legal amendments regarding car access restrictions in different areas, considering clauses tied to pollution levels
- Recommendation 7 – to promote imposing environmental conditions for private public transport prior to authorising operation.
- Recommendation 8 – the analysis carried out by the project evaluation team emphasised the environmental benefits of the shift in vehicle powering source; therefore, bearing in mind the exponential increase in private car ownership (throughout Romania) it is recommended that other cities follow Suceava's example and take similar steps to reduce the level of pollution from motorised traffic and improve the quality of life in the city, with focus on crowded residential areas where discomfort is even greater.

Transferability

This measure is seen as an intermediate step as part of an ongoing development process towards the use of biogas in fleet vehicles in Suceava and the promotion of other clean vehicle technologies to the general public, whilst at the same time delivering environmental improvements in its own right. Both the short term and long term objectives could be considered as transferable to other cities.

Components relevant to transferability of measure 5.7	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Pollution reduction policy	High	1	The presence of a strong policy to reduce emissions from all sources within the city, as is the case in Suceava, is an important enabling and driving factor for this measure which would help support its implementation.
	Public transport policy	Medium	0	Integration of the pollution and public transport policies provides extra impetus for the measure by ensuring that the public transport operators are subject to a requirement to improve their environmental performance through measures such as this.
Target Population				
	Fleet operators	High	0	Fleet operators generally find it easier to make decisions about issues such as this because they are more likely to have access to the funds necessary for initial investment if they can see a long term financial benefit to their operation.
	Individual users	Low	-1	Individual users are more dependent upon the open market for support in their decisions – i.e. need more of a policy push and incentive support in order to deviate from the norm.
Geographical Area Covered				
	Whole City	High	-1	For most measures such as this it is important to establish consistency across the city in order to ensure that fuelling facilities are developed in a way that supports consistent access. When relying on stakeholder engagement there is a risk that inconsistent levels of availability of fuelling facilities may lead to infrastructure provision that is not of a suitable level for end users. It is also difficult for a single city to take action on its own unless it is the dominant city in the local area, because of vehicles needing to operate in more than one location.
Finances				
	Investment and running	High	-1	The measure is easier to implement in fleet vehicles where, once the business case

Components relevant to transferability of measure 5.7	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
	costs			has been established, the implementation can be controlled an enforced. LPG fuel costs are generally lower than conventional alternatives, depending on taxation policies, which is a driver providing the initial investment costs on vehicle conversion / purchase and fuelling infrastructure can be overcome.
Stakeholders' Involvement				
	Stakeholders supplying, storing and distributing fuel and clean vehicles Vehicle (fleet) users Public authorities	High High High	+1 0 +2	It is key to have organisations in place who can supply all elements of the technical offer. This was the case in Suceava because LPG already had a foothold in the local market, which made expansion easier. LPG is generally available across Europe, from all the major fuel suppliers as well as smaller commercial players, subject to local market conditions. Ultimately the use of LPG fuel will depend on acceptance and uptake by end users and so their involvement is crucial, although likely to depend on commercial factors which are in turn dependent upon local public policy, vehicle and fuel availability and the fiscal regime. The public authorities have a key role both in initiating and supporting this sort of technical measure, which if left to the free market would take longer to establish.
Legal or Contractual Requirements				
	Partnership agreements required	Low	+2	In the case of Suceava there is no evidence of contractual issues being a key factor. However, in many cases some form of agreement will be likely to establish long term commitment from all parties, the terms of any public support and what is expected in return
Awareness and Communication				
	Publicity and user	High	+2	The publicity element of this measure has been very important to drive uptake among smaller fleet operators (particularly taxi operators) on the back of the use

Components relevant to transferability of measure 5.7	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
	communication			of LPG in the public transport fleet and the municipality's own LPG car. Also important to raise wider awareness of clean fuels with the general public.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 6 years					
Year	Expenses: Set-up Costs (Fixed Cost)	Expenses: Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	33,563	0	0	-33,563	-33,563
Year 2	33,244	0	0	-33,244	-66,807
Year 3	50,044	0	0	-50,044	-116,851
Year 4	30,052	0	0	-30,052	-146,903
Year 5	0	0	0	0	-146,903
Year 6	0	0	0	0	-146,903
Total	146903	0	0	-146,903	
NPV	134787	0	0	-134787	
Average net present annual cost				-22465	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	74226	0	0	-74226
NPV	68104	0	0	-68104
Average net present annual cost				-11351

The annual impact on pollutant emissions from the promotion of LPG as a vehicle fuel in Suceava was as follows:

CO_2: reduction of 360 tonnes

CO: increase of 789.5 kg

NOx: reduction of 260 kg

Particulates: reduction of 252 kg

Assuming no future change to the operating regime of the freight consolidation centre and converting these values to annual terms then cost effectiveness values become:

CO_2: RON 62.4 per tonne or € 31.5 per tonne

CO: -RON 28.5 per kg or -€ 14.4 per kg

NOx: RON 86.4 per kg or € 43.7 per kg

Particulates: RON 89.1 per kg or € 45.0 per kg

3.5.3 Measure 6.4: Extension of Low Emission Zone (LEZ)

The purpose of this measure was to reduce traffic emissions in the city centre, to create more "environmentally friendly areas" and to improve the quality of life in the city. The main objective of this measure was the extension of existing LEZ, to create facilities for cyclists and pedestrians and to implement access vehicle restrictions in the historical centre of Suceava.

Key Results

The key results are as follows:

- A decrease the traffic emissions and an improve the air quality within the LEZ area caused by reduction in public and private transport in the core historical centre;
- An improvement in the quality of life in the city centre by reducing pollutant emissions and noise levels caused by road traffic (6.02% NOx and 21.6% PM_{10} annual average levels decrease, 33% of respondents considered that noise is more acceptable in 2008 comparing to 2005);
- Improvements in the citizens' perception for the LEZ concept (6% increased satisfaction for existence and use of the LEZ in the city centre and 6.4% decrease of the number of people dissatisfied both with existence and use). This result is fundamentally necessary for the success of measure completion and for multiplication of similar actions in other parts of the city.
- Improvements in the businesses' perception for the LEZ concept (increase satisfaction for existence and use of the LEZ in the city centre by 23.3% and 20% decrease of the number of business owners dissatisfied both with existence and use). We specify here that also the businesses pattern located in the city centre changed, the area being more populated with mobile network agencies, tourism agencies, agencies of smaller banks, confectionary room, a pub, places that don't demand a daily presence during work times.
- Extension of pedestrian areas with a change of priority from vehicle access;
- Increased political involvement in potentially unpopular measures. Tackling the political media is vital for implementation of this activity, the acceptance and putting into force of such unpopular measures on short terms. The transformation of policy directions cannot be done rapidly, as they always take into consideration what the population desires and expects and the process is quite complex in a varied community (these multiple changes incurred in this 4-year project had an important impact on mentalities and they pervaded naturally the life in the local community and they have been also accepted willingly).
- Confirmation of the environmental contribution of this measure in preparation for compliance with the European air quality standards.

Recommendations

- Recommendation 1 – the city centre hosts a large number of residents besides the commercial businesses. The range of premises is big and ideally the LEZ would include a wider area;
- Recommendation 2 – to prepare measures that would make the LEZ - at the size that it will be after completion of the current project – a more attractive part of the city centre to pedestrians, therefore inducing to people's mind the need to walk and experience other entertaining activities within this area;
- Recommendation 3 – develop associated policies such as park and ride, on street parking management and city centre car parks (facilitating a park and walk concept) in order to facilitate

the movement of those who continue to use their cars for the journey to the city centre, but in a controlled way so that the city can generate revenue and control movements to the benefit of the city as a whole;

- Recommendation 4 – additionally, promotion campaigns should tend to prepare another way of thinking about traffic impact on the environment and on people's health;
- Recommendation 5 – to identify solutions for allotting space to bicycle infrastructure, in order to be able to cut down the modal share of trips using motorised vehicles within the city centre.
- Recommendation 6 - with regard to cities experiencing similar problems, we suggest to seek locations where the LEZ concept can be implemented (partially or totally) and to organise personalised information campaigns for the citizens, emphasising its main benefits according to their needs.

Transferability

This measure has potential for transfer to many cities as a way to provide a better city centre environment. It should be noted that the approach taken in Suceava is more akin to what in western Europe might be called a pedestrianised area, but that the objective is driven more by environmental concerns than congestion (although the sharp increase in traffic in the city as a whole during the project period might have triggered this measure in due course anyway even if the environmental effect had not already done so).

Components relevant to transferability of measure 6.4	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Strategies and Policies				
	Pollution reduction, public transport and accessibility policies	High	0	This activity in Suceava is driven by an integrated application of three policies with the intention to maintain good public accessibility to the commercial heart of the city in a way that supports the financial viability of the public transport company and provides a high quality environment for Suceava's citizens. In other locations the challenge may be to get all three policies into alignment.
Target Population				
	General population Car users	Medium High	0 -1	Adoption of the low emission zone among the general population of Suceava is relatively straightforward as car dependency, although growing, is less strongly developed than in other cities. Efforts to show the benefits of the low emission zone by the use of the space for city-wide promotional events have helped in this regard. Design of the LEZ has been based around making it difficult for car users to abuse the access restrictions to the designated area and for there to be no benefit for them to try. The success of this depends on the extent of the LEZ that is adopted, the existing road layout and the degree to which diversions around the LEZ can be implemented for through traffic, which was relatively straightforward in Suceava.
Geographical Area Covered				
	City centre Ecological bus routes Whole city	High High Low	0 1 -1	The definition of the core city centre LEZ has been the focus for the measure but it has helped support the other elements. The ecological bus routes have be helped by the presence of the city centre LEZ as it gives them a focus, given that they are the only official transit route across the city centre LEZ. The efforts to implement the LEZ concept at other locations in the city have been more difficult because of the different nature of the locations, with less of a specific area to focus on, no high frequency ecological bus corridor, and more of a feeling from businesses that the peripheral areas are at risk should a local LEZ

Components relevant to transferability of measure 6.4	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				deter some people from visiting.
Finances				
	Low investment strategy	High	-1	The approach taken in Suceava has been a relatively low tech solution which has provided significant local benefits. It is unlikely that such an approach would be viewed as appropriate in west European cities where there is a higher expectation in terms of regulation and technological support to traffic regulation / restriction and where city centres tend to be more congested.
Stakeholders' Involvement				
	Local authority General public Businesses affected	High High Medium	+1 0 -1	The measure is clearly driven by the local municipality. They have, however, made big efforts to engage with the local population to demonstrate the benefits of having a LEZ to the local population, through city-wide events etc. They have also engaged with the businesses to show them that the provision of a high quality local environment can help their businesses by providing an environment that their customers wish to spend time in.
Organisational or Institutional Aspects				
	Mayoral control	High	0	The strong local control exercised by the municipality, and within that the role of the city's mayor, have clearly been driving and determining factors in this measure, which may not have been so easy to replicate in cities with other institutional structures.
Technical Requirements				
	Low tech solution	Medium	0	As already stated, the approach taken in Suceava has been a relatively low tech solution in order to keep implementation costs to a minimum.

Components relevant to transferability of measure 6.4	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Awareness and Communication				
	Publicity, public relations and citizens' involvement	High	0	The publicity element of this measure has been very important to demonstrate the benefits of the measure and to ensure engagement with the general public. The people of Suceava appear to have a very strong affinity with their city, which may be difficult to exploit in a similar way in other locations.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 15 years				Nett Total Cost	Cumulative Cash Flow
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure		
Year 1	35,811	21,005	0	-56,816	-56,816
Year 2	56,775	31,253	0	-88,028	-144,844
Year 3	64,754	23,522	0	-88,276	-233,120
Year 4	233,602	15,322	0	-248,924	-482,044
Year 5	0	0	0	0	-482,044
Year 6	0	0	0	0	-482,044
Year 7	0	0	0	0	-482,044
Year 8	0	0	0	0	-482,044
Year 9	0	0	0	0	-482,044
Year 10	0	0	0	0	-482,044
Year 11	0	0	0	0	-482,044
Year 12	0	0	0	0	-482,044
Year 13	0	0	0	0	-482,044
Year 14	0	0	0	0	-482,044
Year 15	0	0	0	0	-482,044
Total	390942	91102	0	-482,044	
NPV	349575	84037	0	-433613	
Average net present annual cost				-28908	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	197531	46031	0	-243562
NPV	176630	42462	0	-219091
Average net present annual cost				-14606

The focus of the measure on air quality measurements within the low emission zone as the direct quantifiable outputs, which are subject to many other influences, makes it difficult to express the cost effectiveness in a comparable way to the other measures.

In fact, there would be a risk of double counting if this was done for this measure as well as measures 5.6 and 5.7 because the emissions reductions delivered by these measures will have contributed to the changes in air quality observed in the low emission zone.

3.5.4 Measure 8.8: Bus Priority Measures and Other Bus Improvements

The main reason for the implementation of this measure was to reduce the environmental impact of traffic and to increase the number of passengers using public transport in order to reduce local car journeys over 3 years by supporting the upgrading the public transport system using priority measures at junctions or traffic lights, as well as allowing tests on a GPS vehicle location system and new ticketing system.

Key Results

The key results are as follows (remembering that measure 8.9 was evaluated as part of a cluster with measures 5.6 and 8.9):

- People have been totally supportive of the implemented activities. Their number increased from 35.7% of the total number of people interviewed in 2006 to 55.6% in 2008 (i.e. more than half of the sample interviewed).
- With regard to public transport patronage data from 2005-2008 shows that there was an increase of 757% in passenger numbers. (July 2005 – March 2006: 73549 passengers / month, January 2008 – June 2008: 630144 passengers / month).
- improved quality of the PT service; all the quality service parameters have been assessed and the conclusions underlined the importance of these new features for the passengers (physical comfort, personal security, lines, trip duration, accessibility of PT vehicles within the bus stops, drivers' attitude, information network and real-time information).
- Internal assessment of the causes of public transport service delays were investigated and conclusions showed that services were influenced by climatic conditions during the winter period and road works that took place in the course of actual modernisation process of the priority junctions.

Recommendations

- Recommendation 1 - To complete the GPS monitoring system implementation with the missing infrastructure and to extend the use of this vehicle locating system from the demo bus to the entire fleet.
- Recommendation 2 – To extend the demo ticketing system from one bus to the entire fleet and improve its use.
- Recommendation 3 – To find further feasible hard measures for road infrastructure allocation, in order to give priority to buses within the main intersections.
- Recommendation 4 – With regard to other cities willing to follow our example, the PT modernisation steps taken in this demo-project can be followed and be complemented with the supporting measures; in this respect we offer as a dissemination material, a very useful brochure, where all the steps are described as they have been implemented. This is a successful model of how to create greener cities, safe, secure and accessible urban PT and a new urban mobility culture for all the citizens.

Transferability

The provision of bus priority was important for the municipality to show the important that it placed on bus as a means of travel in conjunction with the upgrade of the vehicles and service provision undertaken in measure 5.6. This was particularly important given the significant raise in car use and associated congestion in the early stages of the project whilst the provision of bus services was chaotic. Without the priority measures the new vehicles would have remained stuck in the queues with the rest of the traffic, so negating the full potential of the new vehicles and services.

Components relevant to transferability of measure 8.8	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Strategies and Policies				
	Public transport policy	High	+2	Suceava Municipality reviewed its public transport strategy as part of the implementation of the cluster of measures 5.6/8.8/8.9 and this included recognition of the important role that information plays in supporting the development of public transport within the city. Prior to the implementation of the public transport strategy the provision of bus services was haphazard and hampered by confusion which would have made clear and comprehensive information provision difficult to achieve.
Geographical Area Covered				
	Routes / City Centre	High	+2	The rearrangement of the bus routes to focus on the main routes within the city centre area, with the LPG buses being focused on the new 'ecoroutes' concept allowed the priority measures to also be focused in the same way. The priority measures were implemented as part of a rolling programme, partly to avoid too much disruption at any one time, but also to help spread the expenditure required. In order to ensure the best impact a study was conducted of each intersection, both to prioritise investment and to maximise the impact at each investment location.
Organisational or Institutional Aspects				
	Administrative structure	High	0	The arrangement in Suceava, where the municipality has complete control over the whole road network and the planning and development system within the city as well as owning the public transport company, provides them with an unusual level of control over the various separate aspects that are linked together to deliver this measure. Such links are not generally present in other countries, which would make implementation more difficult.

Components relevant to transferability of measure 8.8	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Awareness and communication				
	User communications	Medium	+1	This measure is both a support mechanism to maximise the benefit of the investment in the new vehicles and service plan, but is also supported both by the provision of service information (measure 8.9) and also wider promotion of sustainable transport (measure 11.7).

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration: 15 years					
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	64,012	23,551	0	-87,563	-87,563
Year 2	35,695	1,688	0	-37,383	-124,946
Year 3	40,769	0	0	-40,769	-165,715
Year 4	68,516	2,511	0	-71,027	-236,742
Year 5	0	0	0	0	-236,742
Year 6	0	0	0	0	-236,742
Year 7	0	0	0	0	-236,742
Year 8	0	0	0	0	-236,742
Year 9	0	0	0	0	-236,742
Year 10	0	0	0	0	-236,742
Year 11	0	0	0	0	-236,742
Year 12	0	0	0	0	-236,742
Year 13	0	0	0	0	-236,742
Year 14	0	0	0	0	-236,742
Year 15	0	0	0	0	-236,742
Total	208992	27750	0	-236,742	
NPV	191648	26519	0	-218167	
Average net present annual cost				-14544	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	105597	14021	0	-119619
NPV	96834	13399	0	-110233
Average net present annual cost				-7349

This measure was evaluated as part of a cluster with 5.6 and 8.9. It is a support measure designed to make the public transport system more attractive to the public as well as making it more efficient with priority over the other traffic. A quantitative evaluation of the impact of this element on overall traffic and hence emissions has not been possible due to the lack of an appropriate traffic model in Suceava. However, the impact is likely to have been much less significant than the primary measure which was the introduction of the new buses.

3.5.5 Measure 8.9: Improved Public Transport Information

The main reason for the implementation of this measure was to reduce the environmental impact of traffic and to increase the number of passengers using public transport in order to reduce local car journeys over 3 years by supporting the upgrade of the public transport system using a range of information methods. It was hoped measures like a system of variable messages signs linked to the public transport measures would achieve these aims.

Key Results

The key results are as follows (remembering that measure 8.9 was evaluated as part of a cluster with measures 5.6 and 8.8):

- Surveys showed that in 2008 22.6% of respondents used the VMS's to find public transport information. The next most popular sources of information were various promotion materials (e.g. leaflets): 20.5% of respondents had used them as a source of information.
- 12.2% of respondents used the Mobility Centre as a source of information. This was probably affected by the late implementation (end of 2008) and its potential would be improved in the near future.
- With regard to public transport patronage data from 2005-2008 shows that there was an increase of 757% in passenger numbers. (July 2005 – March 2006: 73549 passengers / month, January 2008 – June 2008: 630144 passengers / month).
- improved quality of the PT service; all the quality service parameters have been assessed and the conclusions underlined the importance of these new features for the passengers (physical comfort, personal security, lines, trip duration, accessibility of PT vehicles within the bus stops, drivers' attitude, information network and real-time information).
- increased awareness for the measures implemented and the whole project, which is a good starting point for the future consultations to be held in order to put in practice new ideas and mechanisms to be designed for a superior traffic management.
- good acceptance levels for the measures implemented and the creation of a base for the new urban mobility culture, from where other related measures can be built upon.

Recommendations

- Recommendation 1 - To maximise use of the Mobility Centre to the benefit of all citizens, by making some important information available in real time via electronic VMSs boards.
- Recommendation 2 – To re-dimension or re-structure the bus fleet according to the growing demand and to adjust the timetables according to the running conditions and even to extend the bus routes coverage towards the outskirts of the city, where the residential areas are being built, based on feedback from the citizens.
- Recommendation 3 – To modernise the bus facilities and to create better travel conditions.
- Recommendation 4 – With regard to other cities willing to follow our example, the PT modernisation steps taken in this demo-project can be followed and be complemented with the supporting measures; in this respect we offer as a dissemination material, a very useful brochure, where all the steps are described as they have been implemented. This is a successful model of how to create greener cities, safe, secure and accessible urban PT and a new urban mobility culture for all the citizens.

Transferability

The provision of additional service information was a vital step to ensure that people could find out about the new public transport service through a range of different methods and locations. This is an essential task to be conducted for any public transport upgrade.

Components relevant to transferability of measure 8.9	Characteristics of the components	Level of characteristic in current context as: high / medium / low	Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)	Comments
Strategies and Policies				
	Public transport policy	High	+2	Suceava Municipality reviewed its public transport strategy as part of the implementation of the cluster of measures 5.6/8.8/8.9 and this included recognition of the important role that information plays in supporting the development of public transport within the city. Prior to the implementation of the public transport strategy the provision of bus services was haphazard and hampered by confusion which would have made clear and comprehensive information provision difficult to achieve.
Services Offered				
	Information channels	High	+2	The decision was taken to use a range of information channels including conventional timetables and leaflets, but also higher tech variable message signs positioned conspicuously within the city centre in order to show the importance given to public transport by the municipality. Use was also made of innovative solutions for the Romanian situation including making information available on the website and within the new mobility centre within the municipal buildings. The rearrangement of the bus services made in measure 5.6 allowed a simplified schematic diagram to be produced and presented at the new bus facilities.
Target Population				
	General public – bus users and car users	High	+2	The information was provided both for existing bus users, following the complete reorganisation of the provision of bus services in Suceava and also in order to attract new users from the general population who lapsed into car use during the early stages of SMILE, prior to the reorganisation when the bus services were chaotic.
Stakeholders' Involvement				
	Local public transport company	High	+1	In Suceava the municipality was in some ways fortunate to be dealing with a single supplier of mainline public transport services which is wholly owned by the municipality. It cases where this is not the situation it would be necessary to work harder in order to develop the necessary involvement in such a project, even

Components relevant to transferability of measure 8.9	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				if it is likely to work in the favour of the bus operators, due to resource constraints, suspicion or a desire to work on their own.
Legal or Contractual Requirements				
	Partnership agreements required	High	0	Where information is being shared between bus operators and the local authority, or where data is being managed on behalf of either party then it is likely that some form of agreement will be required to specify what data can be shared and what it can be used for. (Again, in this respect Suceava municipality was fortunate to be dealing wit a single supplier of mainline public transport services which is wholly owned by the municipality.)
Technical Requirements				
	Information / data	High	+1	In locations where this type of technical information has not been carried out previously care should be taken during tender and implementation processes that the appropriate level of technical specification is conducted in order to avoid subsequent problems linked to system incompatibility.
Awareness and communication				
	Citizens' involvement	Medium	+1	When developing an information strategy it is easy to overlook the needs of the end users. It is recommended that time is spent researching user needs in terms of content and presentation to ensure the information is used to its utmost.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration:	8 years				
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	27,083	2,553	0	-29,636	-29,636
Year 2	19,870	0	0	-19,870	-49,506
Year 3	58,747	11,200	0	-69,947	-119,453
Year 4	215,135	21,581	0	-236,716	-356,169
Year 5	0	0	0	0	-356,169
Year 6	0	0	0	0	-356,169
Year 7	0	0	0	0	-356,169
Year 8	0	0	0	0	-356,169
Total	320835	35334	0	-356,169	
NPV	285180	31375	0	-316555	
Average net present annual cost				-39569	

Adjusted to Euros, allowing for purchasing parity conversions					
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	
Total	162108	17853	0	-179961	
NPV	144093	15853	0	-159946	
Average net present annual cost				-19993	

This measure was evaluated as part of a cluster with 5.6 and 8.8. It is a support measure designed to make the public transport system more attractive to the public through promotion of the system. A quantitative evaluation of the impact of this element on overall traffic and hence emissions has not been possible due to the lack of an appropriate traffic model in Suceava. However, the impact is likely to have been much less significant than the primary measure which was the introduction of the new buses.

3.5.6 Measure 11.7: Information and Awareness

Changing people's mentality and behaviour regarding traffic and public transport is a requirement if best use is to be made of the investments and efforts made by Suceava Municipality in the SMILE Project.

For this reason one of the most important activities within the project has related to promotional campaigns, dissemination and information regarding facilities, opportunities and recommended solutions. This goes beyond the provision of functional information about public transport in measure 8.9, which meets the standard need, to include motivating seminars, workshops and special events with the aim of making citizens more aware of the benefits and detailed aspects of alternative transport plans.

During the project duration a Project Team from the Municipality ran marketing campaigns in universities, schools, high schools and workplaces. Promotional activities (e.g. on-street activities, shows, exhibitions, alternative vehicles promotions, local festivals) were organized in the city centre in the middle of LEZ. All this was achieved working in partnership with other local organisations such as Health and Education Authorities, local environmental organizations and the Environmental Protection Agency

Key Results

The key results are as follows:

- High levels of awareness and acceptance for the measures implemented in SMILE, showing significant increases over the baseline; 87.6% of the interviewed showed awareness for the measures and 79.1% of them showed acceptance of the measures (whilst nobody showed dissatisfaction with the existence of and use of measures implemented)
- improved perception of the quality of the public transport service, judged against a selection of relevant indicators such as:
  - vehicle comfort
  - vehicle accessibility
  - organisation of the bus lines
  - personal security
  - attitude of the drivers
- improved use of alternative modes of transport, by improving occupancy of PT vehicles (by 3.1 times comparing 2008 to 2005) and by implementing the travel plans into the personal travel pattern for the local institutions' employees
- valuable feedback as to the future information activities that are likely to engage best with the public and lead to the best results, shown by the level of information and the active involvement of the young generations in this category of initiatives which will reap rewards in both the short and long term.

Recommendations

- Recommendation 1 - to maximize use of Mobility Centre to the benefit of all citizens by making some important information available in real time to the electronic VMSs boards and by extending their public profile and use
- Recommendation 2 – to implement the software solution for making the electronic VMSs boards a good support for other type of real time information, besides the information about pollution levels
- Recommendation 3 - to continue with the promotion campaigns supporting the bus fleet and other measures and improve the information network, as improvements are made in the public transport offer
- Recommendation 4 – to monitor the use of travel plans and to promote them to be used to a greater degree by more citizens and to extend the travel planning concept in accordance with all available mobility systems and integrated in the collaborative mobility networking projects

- Recommendation 5 – to organise further seminars, workshops and conferences within schools and at work-sites, on regular basis, considering all generations of pupils and employees
- Recommendation 6 – to make use of press conferences and meetings with Real Estate Owners and administrators as a special wire to transmit information from the public administration to the citizens, especially to those who cannot be reached in the daily activity
- Recommendation 7 – to stay in touch with all the relevant public institutions and to encourage collaborative efforts to changing citizens' mentalities with regard to urban mobility and healthy conditions of life in the city, by engaging them into a joint effort.

Transferability

There is no doubt that the approach taken in Suceava to providing extensive promotional campaigns in support of sustainable transport has the potential to be widely transferable. The main problem experienced with this type of measure is that, because it is a support measure, it is difficult to identify direct benefits from the campaigns rather than the infrastructure and service improvements themselves. This often leads to difficulties in obtaining the necessary funding.

Components relevant to transferability of measure 11.7	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
Target Population				
	General population and target sub-sectors	High	+1	The work in Suceava has the general public as the end target group. There is no formal segregation of the campaign message, except for the fact that the campaign is delivered in part at particular locations such as schools, workplaces, health centres etc.
Services Offered				
	In-depth research and evaluation	Medium	0	More sophisticated approaches to sustainable travel campaigning have been developed elsewhere to establish different marketing approaches for different modes and people who already use sustainable modes to a greater or lesser extent, but this requires a more significant research budget
Finances				
	Set-up and running costs	High	0	Finance for this type of support measure is often overlooked by those involved in developing the primary infrastructure or service upgrades. This may be due to a feeling that the new system is clearly so much better than what went before that it will almost sell itself. However, this assumes that people are aware of what has changed and that they will be willing to change what may have become fixed travel habits without a significant marketing effort. However, such a marketing effort will undoubtedly require significant planning, resources for staff time and information materials and also evaluation surveys to establish which of the marketing efforts are bringing results.
Human Resources				
	Staff time	High	0	Staff time is an essential element of this type of information project, particularly for the very personal methodology used in Suceava which relied heavily on staff from the municipality working with managers in the collaborating organisations to make presentations to the wider group of people in the collaborating organisations
Stakeholders' Involvement				
	Appropriate collaborations	High	+2	Suceava municipality have succeeded in motivating many organisations to collaborate with them. This has been achieved by the willingness of the

Components relevant to transferability of measure 11.7	**Characteristics of the components**	**Level of characteristic in current context as: high / medium / low**	**Likely ease of achieving required level elsewhere (support +2 to -2 constraint for transferability)**	**Comments**
				municipality staff to become directly involved (backed by their management support and the budget to allow this). This has been mirrored elsewhere, although the willingness of organisations to become involved does vary, especially if they perceive it as being an extra burden. In such cases it is important to explain the benefits to the host organisation, as well as their staff members / customers, in order to achieve management buy in.
Wider Issues				
	Receptiveness to marketing	Medium	0	Although not a particular issue in Suceava, it is likely that in some western societies where consumers have become used to sophisticated marketing techniques that this type of project will need to be equally sophisticated in order to make any impact – see references to detailed market research techniques in earlier sections.

Costs, Revenues and Cost Effectiveness

All Costs in National Currency					
Measure Duration:	6 years				
	Expenses				
Year	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost	Cumulative Cash Flow
Year 1	9,813	0	0	-9,813	-9,813
Year 2	10,486	0	0	-10,486	-20,299
Year 3	28,210	0	0	-28,210	-48,509
Year 4	150,320	16,311	0	-166,631	-215,140
Year 5	0	0	0	0	-215,140
Year 6	0	0	0	0	-215,140
Total	198829	16311	0	-215,140	
NPV	175709	14214	0	-189923	
Average net present annual cost				-31654	

Adjusted to Euros, allowing for purchasing parity conversions				
	Set-up Costs (Fixed Cost)	Operational Costs	Revenue from Measure	Nett Total Cost
Total	100462	8241	0	-108704
NPV	88780	7182	0	-95962
Average net present annual cost				-15994

The information and awareness campaigns in Suceava have provided a general support mechanism for sustainable transport in the city and surrounding area. Once again, quantifying this impact in terms of energy and emissions over a diffuse area would require a level of modelling that is not possible in Suceava.

4 City-Level Evaluation Outputs

This chapter considers the broader effects of the SMILE measures are considered for each participating city. This has been informed using the Cumulative Effects Assessment (CEA) assessment outlined in section 2.2.4. Cumulative effects are changes to the environment that are caused by an action in combination with other past, present and future human actions. In the literature, cumulative effects are often characterised as negative impacts, e.g. too much activity resulting in degradation of habitat. However, in the context of SMILE, the action is the SMILE measure or group of measures and is therefore more likely to have a positive impact although our analysis also monitors for (unexpected) negatives.

In the SMILE programme, a variety of indicators were selected to assess the impact of individual measures. Chapter 3 highlighted the results of the individual measures, focusing on their impact on the selected indicators. CEA considers the context beyond individual SMILE measures. In the current chapter we are therefore interested in how the effects of the action under consideration (the SMILE measure) has interacted with the effects of relevant past/present/future developments and actions The scope of analysis therefore encompasses:

- The SMILE measure (or measures)
- Past transport measures
- Things that will happen in the future – e.g. as part of existing transport strategies
- Other plans and projects – initiatives from other areas of the local authority (e.g. land use planning) that will lead to a change in these indicators
- Wider policy - e.g. national policies in relation to clean vehicles
- External factors - e.g. changes in fuel price or the wider economy

The detailed methodology has been dictated by the sources of data available. Where quantitative data are available then they have been used. However, qualitative data assembled through interviews and documentary analysis have proved a far richer source. This has significantly limited our ability to arrive at overall quantitative assessments of the impact of SMILE on key variables such as emissions, fuel use or modal split. Nevertheless, robust qualitative conclusions have been possible.

The format of the analysis varies slightly from city to city, which reflects the greater scale of the measures and associated evaluation data in Malmo and Norwich - the lead cities within SMILE. This in no way devalues the work conducted in the follower sites of Tallinn, Potenza and Suceava, but reflects the fact that the breadth of the data available in Malmo and Norwich allows a more detailed assessment within a broader range of sub-categories.

4.1 Malmo

4.1.1 Administrative and Planning Structures in Sweden

The system of Swedish government is divided into three administrative levels: the central, the regional county and the municipality. The three levels contain both directly elected councils and administrative state units. In terms of the intermediate level of public administration, this consists of directly elected county councils (landstinget) and regional state authorities which perform tasks at the regional level.

Policy making in Sweden is highly decentralised with regional and local authorities being granted considerable autonomy, such as being able to impose tax on private income, although the national government provides the framework and structure for local activities. The state sets out general policies to be applied across the country but also policies which might be spatially specific for particular topics such as infrastructure. At the end of the 1990s the government decided that spatial planning had to be part of an integrated environmental policy. Therefore, with regards to present strategies for sustainable development in planning, the Swedish government has been engaged since the 1990s in promoting cooperation between private organisations and municipalities to achieve a sustainable urban landscape. By promoting the use of new technologies, and designing a strict environmental policy focused on planning, housing, construction, renewable energy and transport, the overall aim of the Swedish government has been to promote sustainable development and economic growth within the context of a new approach to welfare (Ministry of Sustainable Development, www.sweden.gov.se/sb/d/2066). Within the tasks of land management and planning, national government agencies monitor development and provide the county administrative boards with information for the application of regulations with national interest as specified in the Environmental Act.

National Level

At the national level, responsibility for planning lies within the Ministry of Environment. The National Board of Housing, Building and Planning is the central government authority for urban environment, natural resources, spatial planning, building and housing. Other state authorities which exercise tasks in the field of land management are the National Land Survey, the National Environment Protection Board, the Central Office on National Antiquities, the Swedish National Road Administration, and the Swedish National Board for Industrial and Technological Development.

County Level

Sweden has been experimenting with different forms of regional government in the last decade to secure sustainable economic growth. As indicated in an interview, Stockholm has its own elected regional government and is required to produce a regional plan. There are nine municipality regions testing out a federation approach to regional government and the remainder are national County Administrative Boards, which are the regional arm of central government.

Sweden is divided into twenty-one counties and each county is also divided into several Municipalities. Each County is headed by a Governor who is a Cabinet appointee. State authorities at the regional level are divided into County Administrative Boards, which have a number of important tasks in planning issues. These Boards have a Spatial Planning Unit which provides advice and comments to the municipalities during the drafting of different plans.

The counties produce regional plans (regionplan), but these are often advisory and focused on economic development and services provision. However recently, with more participation in regional planning from EU (and EU’s ESDP), there have been movement towards more regional interaction among local authorities. This can be observed in growing interest for comprehensive planning strategies at the trans-national level with Denmark.

The area relevant to this report is Region Skåne that was created in 1999 by the amalgamation of the Malmöhus and Kristianstad County councils and some of the tasks handled by Malmö Municipality. The Regional Council of Skåne is the highest decision making authority with 149 members that are elected every four years by the inhabitants of Skåne in a general election (http://www.skanetrafiken.se). Skånetrafiken is the regional public transportation authority and operator in Skåne. The principle mission of Skånetrafiken is to plan for and market public transport in Skåne (http://www.skanetrafiken.se). It also procures and organises the work of private transport companies that run the transport services for Skånetrafiken. The private companies offer bids to run routes or staff certain functions for Skånetrafiken. The "City of Malmö" and Skånetrafiken closely cooperate in implementing integrated public transport policies in and around Malmö.

Local Level

There are 289 Municipalities in Sweden. Their responsibility includes city planning, education, social welfare, childcare, fire protection, recreational and cultural amenities. The municipality has the task to plan the use of land and water within the legal framework set and supervised by the government. This is established in the Planning and Building Act.

Municipalities have to prepare a Comprehensive Plan (oversiktsplan) expressing general aspects of land use and development. These broad plans provide a framework for the design of detail plans and for co-ordination of public sector activities as well as demonstrating how each Municipality has taken into account national interests. These plans by law have to be further developed and edited every 4 years. They also include a period of consultation with the public and with interested institutions.

A significant planning instrument for urban change is the detailed plan, which involves negotiation between developers and the Municipality. Detailed plans can cover all aspects of design from land use and provision of public spaces or parking areas to construction materials, design and conservation.

Based on the discussion above, Table 4.1.1 shows institutional arrangements, planning instruments and levels of influence identified in Sweden at the different levels of government. The following section focuses on spatial changes within a regional/trans-national context.

Table 4.1.1: Summary of the planning structure in Sweden

SCALES	Local	National	Regional	Trans-national
INSTITUTIONAL ARRANGEMENTS	Municipality (289)	Ministry of the Environment National Board of Housing, Building and Planning National Environment Protection Board & Others	CM Port Öresund Committee County (21)	EU
Planning instruments	*Oversiktsplan* *Detaljplan* – participatory mechanisms	Guidelines for planning and fund allocation	*Regionplan – advisory*	*ESDP*
Level of influence	Municipality - Very influential	Not very influential at the local/regional level	Lowest degree of influence – but growing	Increasingly influential

Having looked at the overall Swedish context and the administrative structure, the next section analyses Malmö in a bit more detail, particularly the Municipal institutional background, along with the economic context, the key infrastructure projects, the planning process and sustainable plans, the environmental and transport situation.

4.1.2 Malmo City – Specific Contextual Factors

The municipality has the leadership and resources to provide all necessary infrastructure for new planning projects and thus is not normally in competition with other municipalities over funding for development

Municipality Institutional Background

The following two departments and especially "the Streets and Parks Department" have been directly involved with SMILE project and are of special interest to this report.

The Environment Department controls food, air, water, noise, environmentally hazardous operations, coordinates Local Agenda 21 and projects for ecologically sustainable development. Traffic supervision is an important part of the environmental control conducted in Malmö. The Environment Department ensures that roads, railways and harbours are built and maintained according to the environmental laws. The Environment Department has supervisory responsibility and monitors that construction does not have harmful impact on the environment, for example, as regards noise and air pollution.

The Streets and Parks Department is responsible for managing, developing and renewing the urban environment in Malmö, planning the city's infrastructure and aiming for a safe and attractive public environment. Around 200 people work in this department, including municipal planners, traffic planners, landscape architects and project managers. It is responsible for public space, for traffic and for sanitation. It designs the infrastructure and "purchases construction" from local companies. It also manages large scale development in Malmö. This department is responsible for the cycle lane network, an important feature of sustainable transport in Malmö.

There is close cooperation between Malmö City Planning Office and the City Real Estate Office, so that from a very early stage an agreement is sought and the Planning Office is able to buy land for future planning projects. The Real Estate Office provides housing, commercial zones, social infrastructure and plans future development. Processes of buying and expropriating land are relatively simple in Sweden. The Municipality also has the right to establish contracts with private owners for land development. Malmö City Planning Office is divided in the following sections:

- Section of Comprehensive planning developing
- Department of Detailed Planning (East and West) developing structure and detail planning. The division of building permission is integrated within this department.
- Department of Surveying

The City of Malmö also owns many organisations and companies that are essential in providing services to the citizens and to raising revenue. This includes:

- Real estate companies:
  - MKB Fastighets AB (100%, City of Malmö owned)
  - MKB Net AB, the municipal housing company (100%, City of Malmö owned)
  - Sturupsaxelns Exploaterings AB (42%, City of Malmö owned)

- Industrial companies:
  - Malmö Hamn AB (50%, City of Malmö owned)
  - Malmö Frihamns AB (100%, City of Malmö owned)
  - Copenhagen – Malmö Port AB (50%, City of Malmö owned)
  - Sydvatten AB (38%, City of Malmö owned)
  - Sysav AB (46%, City of Malmö owned)
- Service Companies
  - Malmö Kommuns Parkerings AB (100%, City of Malmö owned)
  - Kommunsassurans Syd Főrsärings AB, the municipal insurance company (100%, City of Malmö owned)
  - Vagnparken i Skåne AB (100%, City of Malmö owned)
  - Madeon AB (60%, City of Malmö owned)
  - Minc i Sverige AB (100%, City of Malmö owned)

Contextual Economic Factors

Currently Malmö's economy is based on small and medium sized industrial, service and trading companies, digital media, logistics, the IT-business being the largest sector, replacing former shipyard and textile industries. Port of Malmö is increasingly becoming a logistics hub with more car manufacturers using Malmö as a location for final product finishing and distribution.

Lund and Malmö are designated as growth engines for the Skäne Region.

The 1995 Vision Plan also established that the majority of the new construction in Malmö had to take place in centrally located areas of unused land or where existing buildings structures could be renovated (Vision Plan, 1995). This focus generated concentration of efforts in the redevelopment of industrial areas and the old harbour, as well as on the regeneration of decaying neighbourhoods. In particular the harbour area was the focus of a local plan prepared by the City Planning Office.

Since 1995 a significant emphasis has been placed on transport connections and infrastructure investment, which is seen as a key prerequisite for economic growth. Within the objectives of achieving a more sustainable city described in the above section there are a number of initiatives, action plans and projects taking place in the city. In summary the City's Comprehensive plan set the following priorities:

- The need to generate more sources of regular employment offering the choice of excellent sites to industries and business to establish.
- Achieving a good living environment for living and working.
- Improving the city centre with the provision of public areas, good access to transport and socially integrated city districts. In this context the Plan encouraged the transformation of centrally located areas previously linked to harbour and industrial use to new residential and commercial districts – e.g. B01 – aiming to create a compact and accessible city.
- Strengthening the role of Malmö as the centre of Skåne region and in the context of the development of the Öresund region, improving the city's environment focusing on emerging tourism and business.
- Reinforcing higher education with the new location of the University in the waterfront (as described above)
- With regards to transport, planning a 'compact city', promoting an environmentally friendly transport system

- Establishing regional and international partnerships with Copenhagen, in particular concerning commercial development and marketing in the Öresund region and with other municipalities in Skåne, such as Lund with a working partnership programme.

The goal of at least a thousand new dwellings per year up to and including the year 2008 was achieved (i.e. a 5 year period). Despite this progress, the local authorities are unable to meet the existing housing demand, which only goes to show how attractive Malmö is as “a city of newcomers”.

Transport and Environmental Priorities

Regarding transport, the City aimed to plan initiatives and improvements in the context of the growth of the Öresund region, considering Malmö as the main access point to Sweden and the Nordic countries from the rest of Europe. The City Tunnel (described in the next section) is an example of major restructuring of the transport system in the city linked to the Öresund Bridge and the Swedish Skåne region. The City aims to decrease dependency on car usage providing better bus connections and interlinked networks and further expansion of the city’s network of bicycle lanes and paths (Malmö Comprehensive Plan, 2000, City of Malmö 2003).

The Swedish Government in an effort to solve “the major environmental problems by the next generation” published the following 15 national environmental targets:

1) Reduced climate impact
2) Clean air
3) Natural acidification only
4) A non-toxic environment
5) A protective ozone layer
6) A safe radiation environment
7) Zero eutrophication
8) Flourishing lakes and streams
9) Good quality groundwater
10) A balanced marine environment, flourishing coastal areas and archipelagos
11) Thriving wetlands
12) Healthy forests
13) A varied agricultural landscape
14) A magnificent mountain landscape
15) A good built environment

In response to the specified national targets above, the City of Malmö commissioned and adopted the “Environmental Programme for the City of Malmö 2003-2008”. Good ways for the people of Malmö to do their bit “include using cycle tracks, using public transport, cutting electricity use and buying organic”. “Systems and travel methods should be developed so that it is easy and efficient for Malmö residents not to use their cars; the cycleway network should be improved”. The following are some environmental objectives in Malmö Environmental Programme relevant to this report:

- Reduced climate impact
  - Carbon emissions in Malmö will, on average, be 25% lower in the period 2008-2012 compared to 1990 levels which entails a decrease of 10-15% from 1999 levels. All energy should be from non-fossil fuel sources in the long term.
  - Emissions from other greenhouse gases should be documented by 2005 at the latest.
- Clean Air
  - Annual average levels of sulphur dioxide should not exceed 5 µg/m3 in Malmö.
  - Annual average levels of nitrogen dioxide should not exceed 20 µg/m3 and hourly averages of 100 µg/m3 should not be exceeded in Malmö by 2010.
  - Levels of low-level ozone in Malmö should not exceed 120 µg/m3 as an eight hour average by 2010.
  - Emissions of volatile organic compounds (VOCs) in Malmö, excluding methane, should have decreased by 4,000 tonnes /year by 2010
- Natural acidification only
  - Levels of sulphur dioxide in Malmö should have decreased by at least 10% by 2010 compared to 1999 levels
  - Levels of nitrous oxides in Malmö should have decreased by at least 40% by 2010 compared to 1999 levels
- A good Built Environment
  - A programme for an environmentally adapted transport system in Malmö will be drawn up by 2004
  - A review of the energy programme will be carried out in every political mandate period
  - Energy use in Malmö will be lower in 2010 than 2000 and should decrease by at least 10% per capita in this period. The share of energy use in Malmö from renewable sources (wind, biofuels, solar, etc) should be at least 500 GWh by 2010
  - The market share of vehicle fleets from renewable sources should have increased to more than 5% by 2010.
  - No one in Malmö should be exposed to noise levels after 2010 that exceed 35dBA in their homes
  - New housing development should have a quiet side where noise levels at the outside wall do not exceed 40 dBA.

Not only the municipality departments but also “city owned” companies cooperate in the implementation of this programme. As it is stated in the programme: “It is important to note that these are actions that really must be implemented rather than being considered as recommendations, as in earlier programmes. One example action area is Traffic and Transport. Traffic impact is probably the most important single environmental issue in the central parts of Malmö. A sustainable transport system needs many kinds of actions.”

A weakness in Malmö’s environment programme might be that no specific emphasis is given on health issues. Nevertheless, the programme has 58 environmental targets, which effectively map onto the Government’s objectives. The SMILE project that ran almost in parallel with the programme timeline, also seems to address many of these objectives.

Two policy documents guide the transformation of the transport system in Malmö, the Strategic Traffic Plan (STP) and the Traffic Environmental Programme 2005-2010 (TEP). The Strategic Traffic Plan is the overall guiding document for the development of the transport system in Malmö. Its main objective is to provide for the mobility needs and vitality of the city while minimising the negative environmental effects of traffic.

The Traffic Environmental Programme 2005-2010 builds on an earlier TEP from 1997 and has been produced in co-operation with all central actors in Malmö with surroundings. The objectives of the TEP 2005-2010 is to lead to a cleaner, quieter, healthier and efficient traffic system. TEP 2005-2010 states clear goals for four years within six areas:

- Pedestrianism
- Cycle traffic
- Public transport
- Freight transport
- Reduced Car traffic
- Transport planning

The modal split in Malmö for 2003 is illustrated in Figure 4.1.1. This is from the "Malmö City Travel Survey" in 2003 with over 5000 respondents and has been used as a reference point in the evaluation of several of the measures..

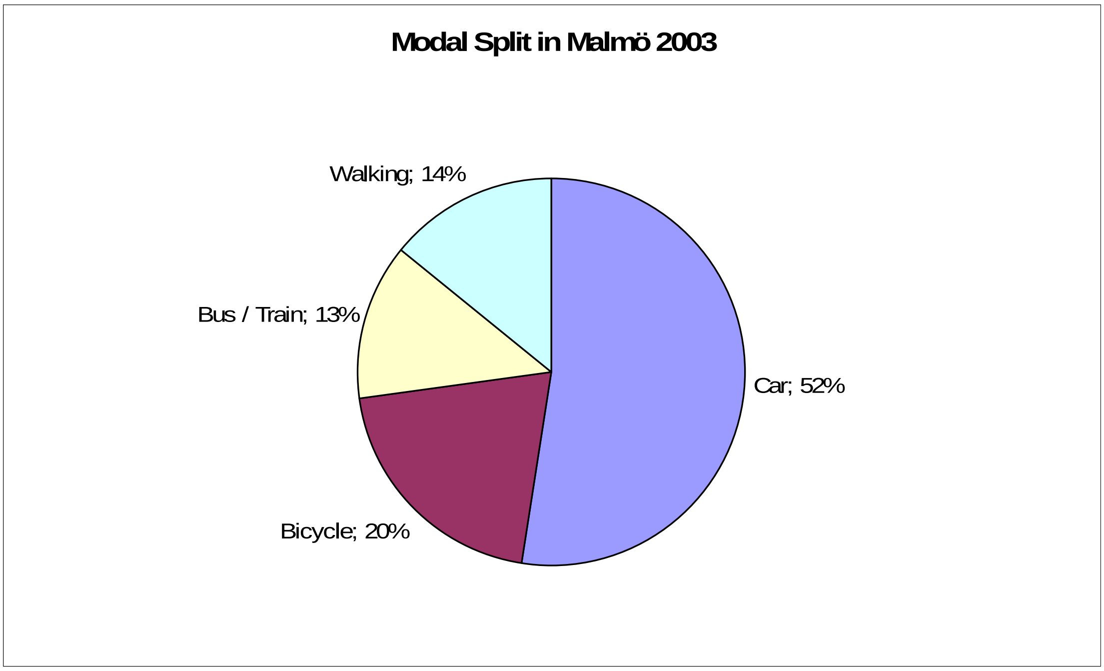


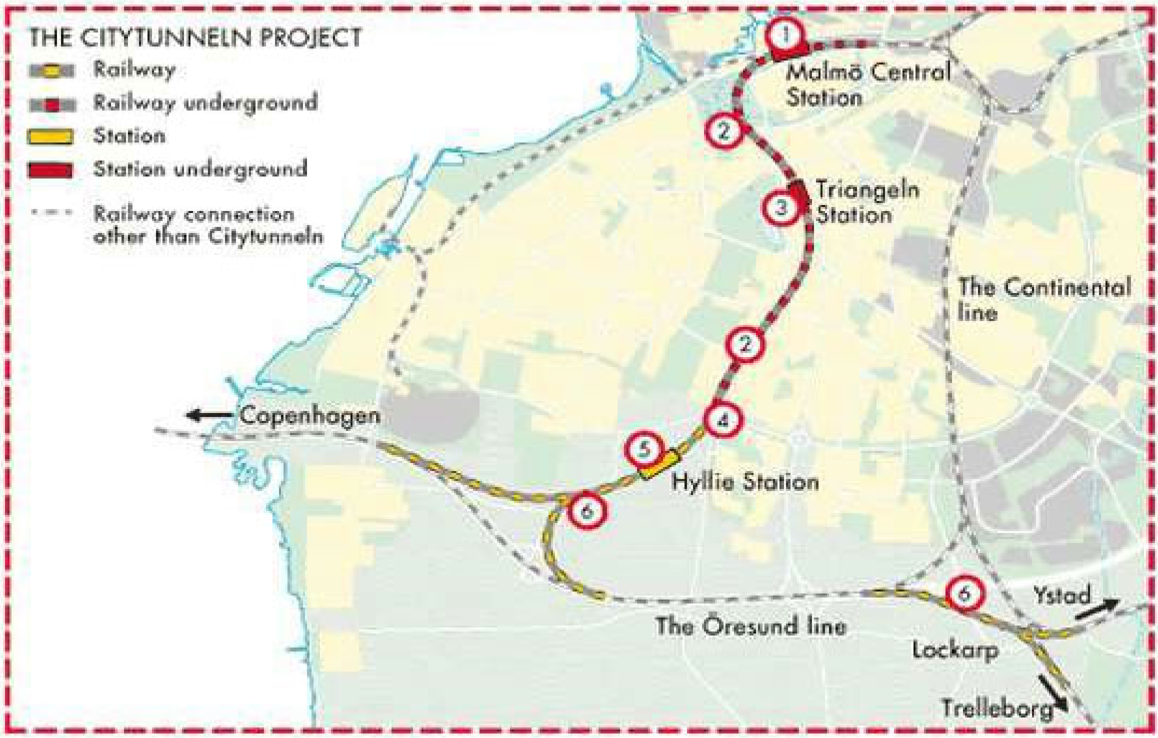
Figure 4.1.1: Modal Split in Malmö in 2003

As expected Figure 4.1.1 shows private cars are to be the dominant transport mode. The plans and policies of the City of Malmö aim at reducing the car share. For example, in one development the bus stops were integrated into the schemes to make them easily accessible, car parking provided was just 0.7 parking spaces per household and most of the area is open to pedestrians. Figure 4.1.1 shows a very high percentage of travellers walking to their destination, which is even higher than public transport users. Weather might be a factor here. The cycling share is also very high, but that is to be expected. Malmö is a leading European city for cycle infrastructure, with 410 km of bicycle lanes, an ambitious Cycle Program, a climate and topography well suited for cycling. Most residents (over 90 %) in Malmö have a bicycle at their disposal and more than 20% of all journeys in Malmö were done by bicycle. Integration of cycling with public transport may well be a priority and there are a couple of SMILE measures reflecting this. The modal split discussion is revisited later in Chapter 4, where these issues are examined in more detail.

Key Infrastructure Project: The City Tunnel

There are some key projects, some completed recently and others are still ongoing, that are important in understanding the context for the SMILE projects in Malmö.

One which has had a significant impact on the implementation plans within SMILE is the City Tunnel, as presented in figure 4.1.2. It is a railway connection from Malmö Central Station to the Öresund link, making it possible to complete the link-up to the Öresund region. The Tunnel project involves the expansion of the Central Station and the construction of two new stations and communication hubs at Triangeln and Hyllie. The project is managed by the National Rail Administration. The Swedish State Railways, the City of Malmö and Region Skåne are partners to the project. The City Tunnel began its construction in 2004-05 and is due to be completed in 2011-12. Its estimated cost is 9 billion SEK.



Source: www.Malmötunnel.se

Figure 4.1.2: The City Tunnel Project

The development of the City Tunnel is linked to a number of more local strategic projects which are integrated with legislation measures, technological and economic policies. The local vision focuses on improving integration, sustainability, continuing city compactness and strengthening social diversity. Development of the central areas is essential in this strategic context and the outer inner ring is the main focus for new urban projects. This objective could not be achieved without improving accessibility and public transport. The SMILE project in Malmö has included measures that aimed at integrating the public transport network and the cycling routes and facilities with the City Tunnel, and as with all such projects the specification and organisation of these subsidiary projects has changed as implementation has approached.

4.1.3 Environmental Effects: Energy Efficiency and CO_2 Emissions

Reduced energy consumption has a variety of positive effects, including reduced depletion of resources and cost reduction. The principle motivation from a public policy perspective for reducing energy use is the impact in GHG emissions. However, from an operational perspective, which is what will drive the take up of some of the measures demonstrated, such as eco-driving training, cost reduction is the key motivating factor. Thus the objectives of reducing energy use and reducing GHG emissions such as CO_2 must be considered as synergistic effects. Despite some difficulties in collecting the necessary data, the estimations of CO_2 reductions provide by far the richest quantitative data from the Malmö SMILE Measures.

As seen in Chapter 3 in the evaluation reports, none of the quantifiable objective targets for GHG were fully achieved, suggesting a degree of unrealistic target setting. However, the overall effect is still significant. If we were to add up GHG emission reductions from all SMILE measures that provide such a figure, we would find a maximum estimate 1955.7 tonnes of CO_2 reduction (this should be strictly treated as a maximum value). However, it is very important that a further integration of estimation methods and assumptions for the different measures should take place, before such an overall figure can be fully adapted as a robust estimate of GHG reductions for SMILE measures in Malmö, given the issue of potential double counting, particularly in relation to production and use of biogas.

Figure 4.1.3 presents an overview of SMILE Measure effects on the energy consumption and GHGs in Malmö. Each measure group is coloured differently, as are the corresponding effects for a certain group. The red lines and comments represent negative effects on the target attribute. The same structure and colouring will be kept for all the following figures that show effects of SMILE Measures to target attributes.

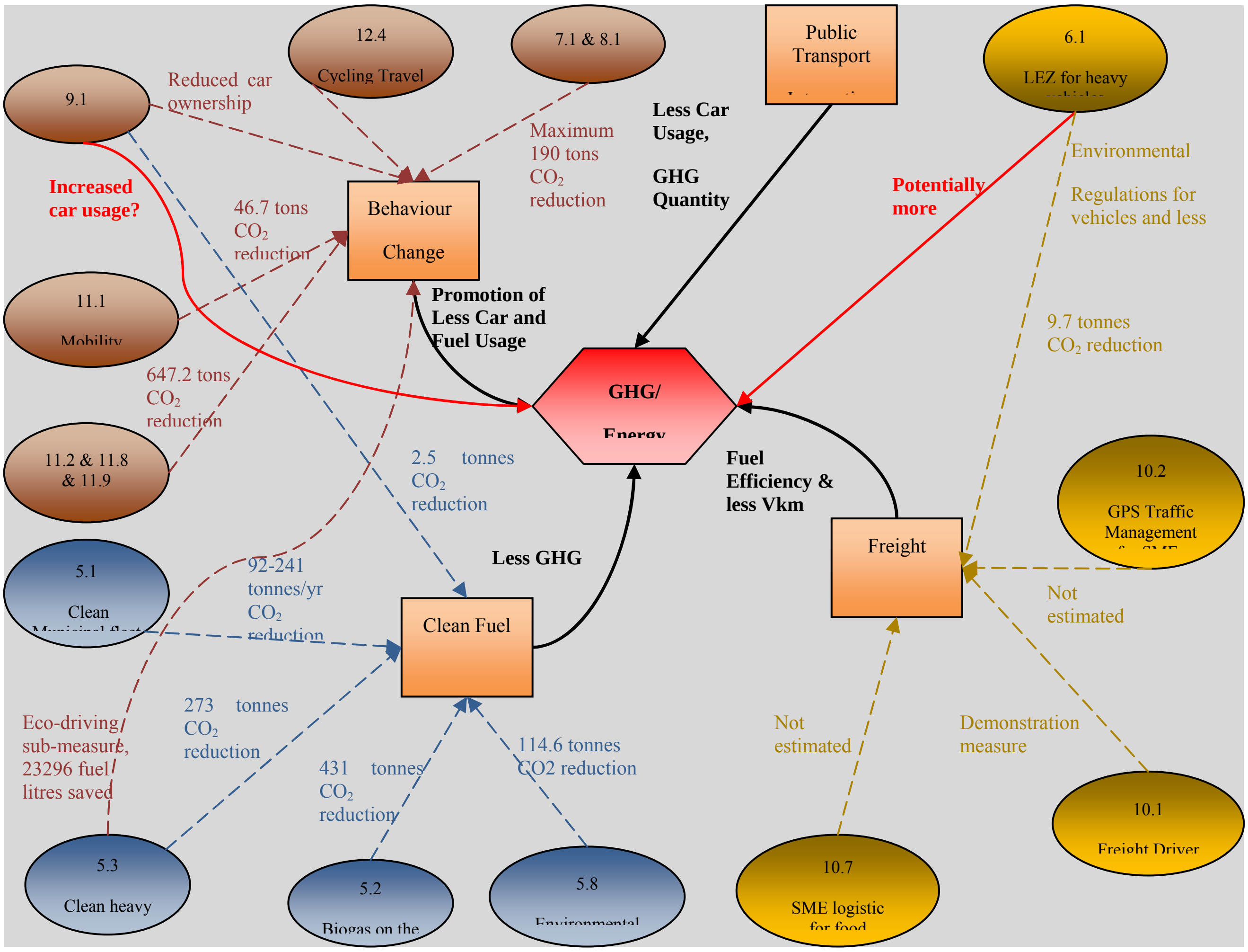


Figure 4.1.3: SMILE Measures in Malmö Impacting on Energy

The "Public Transport Integration" group of measures do not explicitly set energy reduction as a target, but overall reduced energy use and GHG will result from encouraging modal shift towards sustainable transport modes. This effect is shown in Figure 4.1.3, but this is the extent of discussion that we can go into for the effect of this group to GHG emissions as the necessary modelling, extracting the impacts from the SMILE measures from the many other external influences was beyond the scope of the evaluation resources available within SMILE. The impacts on energy use by the remaining measure groups are discussed in more detail below. However, it is noted that the non-quantifiable GHG/energy effects, of measures influencing future transport behaviour, will be the real long term outcomes (affecting the situation well after the project end).

Behavioural Change Measure Group

The eco-driving driving measures have led to significant CO_2 reductions. The success of these measures might be partly due to the attitude towards "eco-driving" in Sweden that is not often found in other countries. This was excellently underlined by an interviewee stating that "nowadays when you are taking your driving lessons, the driving school has to teach you eco-driving". Hence, eco-driving is part of the "formal" education and training procedures.

The evaluators in Malmö convincingly argue that there is difference between the fuel reductions achieved in "heavy eco-driving" and "normal eco-driving". There are several factors contributing to this, with the most important being the strong incentive of professional drivers to reduce fuel consumption, which is a major

The degree to which the benefits of ecodriving are sustained depend upon the frequency with which refresher training is held (if at all) and the extent to which there is an incentive to maintain the newly learned behaviour.

Within measure 11.9 the drivers are predominantly owner drivers of HGVs, for whom fuel is a significant cost in their "business". This was also highlighted in the interviews, where it was stressed that the cost of "heavy eco-driving" classes will be recovered every time by the drivers within a very small period, essentially leaving them with profit. For this group an initial reduction in fuel use of 17% fell to an ongoing reduction of around 10%.

As part of measure 5.3, 16 drivers of HGVs who are employed by the local dairy company received ecodriving training. The initial impact was again substantial, at 13% reduction, but the indication is that without either a direct financial incentive (remembering that these are employees rather than owner drivers) and with no refresher training, the impact dropped to around 3% in the long term. There are ways around this that have been widely adopted elsewhere, that involve the employer, in this case the dairy company, initiating a fuel monitoring and incentive programme which can more than pay for itself in terms of saved fuel cost.

With measure 11.2 employees of the city of Malmo who use municipality vehicles as part of their job received ecodriving training. The initial reduction of fuel was again about 13% but since the employees have no incentive to continue to drive this way, (fuel savings do not accrue to them, they are not rewarded in some other way and there was no refresher training) these savings have approached zero within a year. The instigation of a reward programme in such a situation where the use of the municipality vehicles is on a more casual basis makes the implementation of an incentive programme more difficult, and suggests that refresher training every 12 months would be a more appropriate strategy within the municipality.

Measure 11.8 involved ecodriving training for a mix of casual and professional drivers within Malmo University Hospital. The overall reduction in fuel use among what was a relatively small group of trained drivers was in the region of 5-7%. It was interesting to note that there appeared to be a greater reduction among the casual drivers rather than the professional drivers as a result of the ecodriving training, possibly indicating that the professional drivers were already driving in a slightly more efficient way. Here again, there was no ongoing support, although measurements were not possible on an ongoing basis to see if the effects declined over time.

As a result of these differences, the much larger distances covered by HGV drivers than the drivers of private vehicles, and the higher fuel consumption per kilometre of HGVs the CO_2 reductions from the HGV measures dominate the ecodriving measures as follows:

Table 4.1.2: Summary of CO_2 Impact of Ecodriving Measures

Measure	Nature	CO_2 reductions	Period
5.3	HGV drivers employed by dairy company	51.3 T	14 months
11.2	Municipal employees, casual drivers	9.4 T	3 years
11.8	Hospital employees, mix of casual drivers and professional drivers	4.3 T	Per annum
11.9	HGV drivers, predominantly owner drivers	633.5 T	Per annum

The car club measure (9.1) has reported CO_2 reductions from the use of clean fuels in part of the car-club company's fleet. Furthermore, this type of measure reduces the need for car ownership and has been in many cases to discourage car use and encourage shifting to more sustainable travel. However, the evaluation report for 9.1 in Malmo suggests an increase in car travel of individuals after joining the car-club (although the survey was limited in its scope). Hence, there might be an antagonistic effect of increased car travel to efforts towards GHG reduction, depending on the balance between car cub members are gaining access to a private car for the first time and those who are relinquishing their own car.

Marketing of clean vehicles by subsidized parking (7.1) is reporting maximum GHG emissions reduction, assuming that one hour free parking would have contributed at the most 10% to the purchasing of the 1031 clean vehicles that are registered with the measure. There are synergistic effects between this measure and Measure 9.1, promoting the use of clean vehicles by the car club through subsidised parking. Measure 7.1 also reinforces the effect of Measure 5.2, encouraging the use of bio-fuel in transport.

Measure 11.1 (Mobility Management) may also have produced indirect positive effects (on climate change) from encouraging a shift towards sustainable transport modes. The measure 11.1M Evaluation Report provides an estimate of 46.7 tonnes CO_2 reductions, as the sum of cycle campaigns and the campaign for the morning travel habits of school children and parents, which are only part of the full range of campaigns that were run.

Measure 11.1S Evaluation Report suggests a minimum of 127 kg CO_2 reductions per day (approx 29.2 tonnes CO_2 reduction per annum) for commuting journeys as a result of the interaction between the regional transport authority and participating members of the workforce in Malmö.

Clean Vehicle and Fuel Measure Group

GHG emissions reduction is, as expected, an inherently central goal for these Measures. Figure 4.1 shows that all of these measures have achieved significant GHG emission reductions, but below their specific targets.

Measure 5.2 (Biogas on the Net) is very important for all measures (i.e. 5.1, 5.3, 5.8 and 9.1) that use bio-fuels, since it is an attempt at producing biogas locally and utilising local sources. The availability of such fuel is the first condition of its use and therefore the measure success and continuation will have future cumulative effects on bio-fuel usage (and CO_2 reductions) for the whole region. However, the estimation of GHG emission reductions for this measure raises the possibility of double counting, since the bio-gas produced may have been used in other SMILE measure.

Nonetheless, the savings that result from this group of measures are substantial

Table 4.1.3: Summary of CO_2 Impact of Clean Vehicle / Fuel Measures

Measure	Nature	CO_2 reductions	Period
5.1	Clean municipal fleet	92 - 241 T	Per annum
5.2	Biogas production and use	431 T	2008
5.3	Clean HGVs	273 T	Per annum
5.8	Clean hospital fleet	114.7 T	Per annum

This measure group would have been expected to produce high energy and GHG reductions. Most of the measures aim at improving the efficiency of freight movement, thus fewer vkms for heavy vehicles and subsequent reductions in energy consumption. However, as summarised below, the measures do not appear to have been able to realise the expected savings.

Measure 10.1 was changed to a demonstration pilot and there are no results to be reported yet. As soon as the measure operates at full scale then significant reductions of CO2 emissions are expected (after the SMILE project). Measure 10.2 does not appear to have been successful, with no significant difference between the before and after situations. Similarly, measure 10.7 has not gained sufficient membership to show a significant impact as yet, (although possible future scenarios of uptake are discussed).

Freight Measure Group

This measure group would have been expected to produce high energy and GHG reductions. Most of the measures aim at improving the efficiency of freight movement, thus fewer vkms for heavy vehicles and subsequent reductions in energy consumption. However, as summarised below, the measures do not appear to have been able to realise the expected savings.

2

Measure 10.1 was changed to a demonstration pilot and there are no results to be reported yet. As soon as the measure operates at full scale then significant reductions of CO emissions are expected (after the SMILE project). Measure 10.2 does not appear to have been successful, with no significant difference between the before and after situations. Similarly, measure 10.7 has not gained sufficient membership to show a significant impact as yet, (although possible future scenarios of uptake are discussed).

The CO_2 reduction estimate for Measure 6.1 (Heavy vehicle LEZ) stems from renewal (newer technology engines) of the heavy vehicle fleets operating in Malmö due to the traffic restrictions. However, the heavy vehicle fleet may have been renewed anyway, meaning that the data is subject to uncertainty regarding the actual effect of the measure and there is a danger of double-counting savings from the clean vehicle and fuel measures.

4.1.4 Environmental Effects: Emissions Affecting Local Air Quality

This section considers emissions other than CO_2, such as NOx and particulate matter. Local air pollution is an important issue for local authorities, as reflected in the Environmental Programme for the City of Malmö 2003-2008, with long term health implications for over exposed parts of the population. An measure leader stressed that the wind has a huge effect on local air quality (Malmö is exposed to high winds), often dissipating many of negative effects of transport (except when occasionally O_3 emissions are blown in from Germany), partly explaining why the NOx and PM10 reductions reported below (resulting from the SMILE measures) are not reflected in the actual emission concentration measurements. Other contributing factors are probably that the emission reductions from the SMLE demonstration measures are small in comparison with the scale of the whole Malmö area from all sectors, and many of the measures were not fully implemented by 2007 (the last available air-quality measurements). However, even measures that do not explicitly set emission reduction as a target may well have a significant effect on local air quality in the long term from encouraging modal shift towards sustainable transport modes.

Behavioural Change Measure Group

This group of measures is expected to have some direct quantifiable pollutant reductions. Measure 7.1 (Marketing of clean vehicles by subsidized parking) evaluation report estimated the maximum level of reductions from the measure to NOx=151kg and PM_{10}=10.3 kg. These numbers are at best an order of magnitude lower than the initial (and probably unrealistic) objectives. The underlining assumption for this figure is that parking permits are directly responsible for the acquisition of 10% of the total number of clean cars registered with the scheme. The effect of using alternative fuel as part of measure 9.1 (car-club) was 1.255kg reduction of NOx emissions and 15g less PM_{10} emissions. There are synergies to be had from closely coordinating these two measures, especially with regards to the local air-quality. This desirable cooperation was mentioned during the interviews, but a possible realisation of this synergy was put after the end of SMILE project.

The eco-driving measures were expected to have limited effects on local air quality. Reductions of 2.38 kg NOx and 0.254 kg PM_{10} were reported for Measure 11.2. Measure 11.8 evaluation report translated the fuel savings to the following emission reductions NOx = 89.7 g and PM_{10} = 8.97 g. Whereas Measure 11.9 evaluation report considers insignificant pollutant emission changes other than CO_2, an assumption supported by Johansson (2003)[12].

Clean Vehicle and Fuel Measure Group

The clean fuel measure group reports significant results in reducing NOx and PM_{10}, except for Measure 5.2 (Biogas in the net) in which focuses on CO_2 emissions rather than other than pollutants as its focus is a comparison of different sources of methane as a fuel renewable vs fossil sourced. For the other measures the impacts will depend on the inherent emissions characteristics of the fuels that are introduced and displaced in the measure. The evaluation of measure 5.1 (Clean Municipal fleet) reports NOx reductions of 505.8 kg and PM_{10} emission reductions of 54 kg. Measure 5.3 (Clean Heavy Vehicles) reports a much higher NOx reduction of 1590kg, with PM_{10} being reduced by 28.9kg. Measure 5.8 (Environmental cars) reports smaller reductions of 21.1 kg NOx and 0.3 kg PM_{10}.

Freight Measure Group

Since most of these measures aim at efficiency of freight movement and therefore fewer vkms for heavy vehicles, one would expect a discernible contribution to local air-quality for this group. However, only Measure 6.1 (Heavy vehicle LEZ) produces estimates for the relevant emission reductions. The priority of a LEZ measure is inherently the improvement air quality (along with congestion and probably noise). The emission estimates reported for this measure have a bigger impact than all other quantified SMILE measures combined, namely 10 tonnes reductions of NOx and 370kg less PM_{10} emitted.

Measure 6.1 is expected to have significant synergistic effects with respect to emission reductions with the other freight measures and with measure 5.3.

[12] Johansson H. et.al. (2003) Impact of EcoDriving on emissions presented on the 12th International Symposium "Transport and Air Pollution", Avignon 16-18 June 2003, page 73.

Public Transport Integration Group

This measure group is not expected to produce significant quantifiable emission reductions, but as mentioned above it may have a significant indirect effect on local air quality in the long term from encouraging modal shift towards sustainable transport modes. Measure 12.2 (Traffic monitoring) was the only one that might have had some direct effect, through shorter travel times, resulting to reduced fuel consumption and emissions. However, the evaluation shows no significant change in travel times; in fact, the limited available data display a negative impact to travel time. This will probably change in the future once the system is properly configured and expanded.

Not only are there are no quantifiable direct contributions to air quality, but there might even be some minor, short term antagonistic effects. Measure 12.7 (Bus priority system antagonistic) for example might cause more stationary traffic and congestion that could increase emissions. The same might be true for measure 8.3 (Integration of cycling with public transport), when giving priority to cycles over motorised transport.

4.1.5 Environmental Effects: Quality of Life

Increasing traffic levels damage the attractiveness of this area and make it a less pleasant place to live or visit. After the Öresund bridge completion, commuters to Copenhagen and direct connection to continental Europe increased car and freight traffic in and around Malmö. Skånetrafiken and the City of Malmö policies recognise this and the SMILE measures help by reducing traffic in this area. The mechanisms by which this works include reducing congestion, noise and diverting large and polluting vehicles from the centre.

SMILE documents highlight the importance placed by government on reducing car journeys and particularly single occupancy journeys. This is reflected in the TEP (see section 1.4.4) for the City of Malmö that has the overall goal of taking decisive steps towards a sustainable transport system by 2010, preparing the “City-tunnel” opening that will be a decisive step towards this direction. All of the SMILE measure groups, except clean fuel group, imply some kind of impact on traffic and congestion.

It has to be pointed out though that in large urban settlements the demand for road space is very high (often assumed infinite), which means any amount of emptied road space (for whatever reason, e.g. new roads, high modal shift) will be filled up immediately from previously repressed demand. To effectively reduce congestion the demand for road space needs to be managed, as the example of road pricing in London that has decreased the traffic or Hasselt in Belgium that successfully banned cars in the city, offering instead free public transport. Malmö’s congestion case is definitely not as severe as London and its highly developed the cycle path network offers a highly attractive alternative transport where the cars are not allowed (which is very positive). However, unless road demand is managed in some way transport measures, as the ones discussed below, will only offer marginal traffic and congestion reductions.

Public Transport Integration Group

Public transport integration group encourages the use of cycles and bus use as alternatives to cars, contributing traffic reduction. Measure 12.2 (Traffic Monitoring) is focused on this specific task by adapting traffic lights to the actual traffic volumes. However, the results were not encouraging; the evaluation report states (pp: 12) that the “system was probably not working optimally during the test period. Therefore there is no reason to up-scale at this point”.

The Bus Priority measure (12.7) would have, on one hand, a long term positive effect on traffic and congestion, by making bus travel more attractive and car trips less attractive. On the other hand the short term effects of this measure would be more waiting time for cars in the traffic lights and thus more congestion.

Measure 8.3 (Integrating cycling & PT) has similar synergistic and antagonistic effects to congestion; namely, cycling becomes more attractive, causing the substitution of some car trips in the long run and thus reducing congestion, but cycle priority over cars and buses at the road intersections with cycle paths increase car waiting time and congestion. These synergistic and antagonistic effects are not expected to be significant for the whole Malmö area, and there are no data at the moment to indicate their magnitude.

The remaining three “Bus Measures”, 8.2 (Security on buses), 12.1 (Real-time Information) and 12.3 (Mobile Internet Bus Information), would have a medium term indirect effect on traffic volumes by making bus travel more attractive again, encouraging people to use it instead of cars. The overall increase in bus use has already been shown in the measure evaluation templates, although the impact on traffic levels has not been identified.

Behaviour Change Measure Group

This is another group of measures that is expected to have some positive indirect effects on traffic and congestion from encouraging shift towards sustainable transport modes (e.g. Measures 8.1 and 12.4). Measure 11.1 (Mobility Management) is an example of such activity, focused on changing people’s transport behaviour through its many relevant campaigns, as for example the cycle campaigns and the campaign to alter the morning travel habits of school children and parents (see Chapter 3).

Measure 9.1 (car-club) aimed to reduce car use and congestion by offering alternatives to car ownership. To our understanding this was not combined with a “formal” car-sharing scheme and the results in the evaluation report show increased car use, hence an antagonistic effect to reducing congestion. Another possible (but minor) antagonistic effect might come from Measure 7.1 (Marketing of clean vehicles by subsidized parking). Free parking of “clean vehicles” might increase trips to central areas of Malmö, subsequently increasing congestion. The eco-driving measures cannot be seen to have any direct effect on congestion, except possibly making car-trips cheaper that might allow the car users to maintain their mileage level, when fuel prices soar.

Freight Measure Group

Measures 10.1, 10.2 and 10.7 aim to improve the efficiency of freight movement, through reducing vkms for heavy goods vehicles. This would signify more road space for cars and buses, thus less congestion. Unfortunately, there is no information available to illustrate the magnitude of this effect. Measure 6.1 (Heavy vehicle LEZ) is not expected to have any significant effects on congestion.

4.1.6 Social And Behavioural Effects: Institutional Change

Amongst the most potentially significant impacts of SMILE has been institutional learning. This section looks at the changes in working which have been initiated by SMILE. These relate to public and private organisations and are about change within organisations and the development of relationships between organisations.

The behaviour Change group of measures have been most influential in bringing about institutional change. In Malmö “soft measures” were given significant prominence and are influencing overall local policy development. Overall, there is now a sophisticated understanding of the relationship between soft and hard measures.

The SMILE measures have demonstrated the importance of engaging with individuals and other organisations to influence long term behaviour. The particular success of Mobility Management (11.1) to this respect has been a beacon of how this has worked.

Mobility management (11.1) is an overarching measure which touches on the other soft measures. It also links well with those which aim to improve the attractiveness of public transport. This is because mobility management (or travel planning) is fundamentally about changing the modal split, providing opportunities to use modes other than private cars to facilitate this shift. When the mobility management team visit work places or schools to promote bus and cycle use, they also provide information (when possible) about walking, car pooling, eco-driving and "clean vehicles". Mobility management is a prime example of a SMILE measure acting in conjunction with wider policies. Furthermore, one of its primary functions was to influence companies in the area through various campaigns (at breakfast meetings) to promote and adapt sustainable transport solutions for their employees. This is an institutional change for the participating companies that will produce significant positive effects far after the end of SMILE project.

Furthermore, this measure has successfully initiated institutional changes within the City of Malmö. The first institutional change was "mainstreaming" the mobility management operations and the establishment of a permanent group within the organisation. Mobility management first started in the City of Malmö in 2001. At that time, only about two or three people were involved on a temporary contract basis. Mobility management operations were found to be important and funding is made available for it beyond SMILE project. The interviewees noted that SMILE gave them the financial freedom to pursue campaigns that otherwise would be difficult. The success of these campaigns and actions demonstrated to the City of Malmö that mobility management was an essential function that should be given more weight and resources. Now they have about 8 permanent employees creating a pool of people and expertise in the department, which was not there before. Hence, involvement with SMILE has increased the capacity of the organisation to implement [transport-related] behavioural change initiatives.

There is even a potentially greater institutional change related to mobility management with significant impacts for many years to come. Those involved in the measure told us they aspired to "be [the] best in Sweden" (among the other City Administrations of the country) in terms of transport policy, promoting environmental friendly cars within the city organisation, establishing car sharing, a cycle pool. After these facilities were in place, the transport plan would proceed to start imposing limitations to car (single occupancy) trips by the city employees. These actions are based on some of the existing decisions and policies (e.g. about "clean cars" relating to measure 5.1) that would be combined with novel approaches and ideas, getting more restrictive each year towards unsustainable travel behaviour. For example, one of the suggestions was that a "city employee" or politician in the City Administration will "not be allowed to travel by plane, if travelling by train is possible".

We were informed that the existing transport policy was introduced back in 1995 and did not address many of the relevant issues of sustainable transport and its promotion. At the time of the interviews (September 2008), the process of officially adapting the new transport policy was ongoing. Each of the 21 departments in the City of Malmö had participated in an internal review and consultation procedure, providing input and changes and comments. Then the transport plan consultation procedure is taken to the "political level", after which the final decisions will be taken.

It was stressed that the procedure of adapting this new transport plan is based on consensus. Other groups, departments or politicians are not supposed to just wipe out any part of the policy. Any changes made to the plan are subsequently agreed by the mobility management group and the senior figures in the City of Malmö supporting this initiative, so that a "good plan" acceptable by all is adapted.

This is potentially one of the biggest impacts that SMILE project might hope to have. Through the Mobility Management measure SMILE project has contributed significantly to changing the policy framework for the City organisation and its employees. We would also expect some indirect cumulative effects and influence to other organisations that cooperate closely with the City of Malmö.

Besides the institutional changes triggered by mobility management, there are some additional effects from other SMILE measures. As noted during our interviews for measure 12.7, for many people their involvement in SMILE provided useful experience in undertaking and managing European projects, especially with regards to “mundane” procedures as discounting, investment periods and the various EU rules on costing and accounting. There were initially some issues with the difference in frameworks between EU and Sweden. SMILE did not change its rules to fit with Sweden’s or vice versa, but as the interviewees put it “having done it once you will know how it works”. This is a cumulative institutional effect that came about through the involvement with SMILE, increasing the capacity of the organisation to implement the transport initiatives. This refers not only to the City of Malmö, but also to the other local organisations that were involved in the project and have now the experience to undertake EU projects in the future.

Another important institutional change took place in relation to measure 5.2 (Biogas on the Net). As mentioned before, this is very important for all measures that use bio-fuels, since it is a project for producing biogas locally and utilising local sources. The availability of such fuel is the first condition of its use. During the interview for this measure, it was noted that they increased their capacity as an organisation to undertake similar initiatives by installing “the catalytic combustion” in the new biogas plant. According to the interviewee, this is new equipment that has not been tested anywhere in the world; technology they will use when they built a new plant. SMILE contributed to this important advance that may result in more widespread production and use of bio-fuel in the Malmö area, with all its positive effects on sustainability.

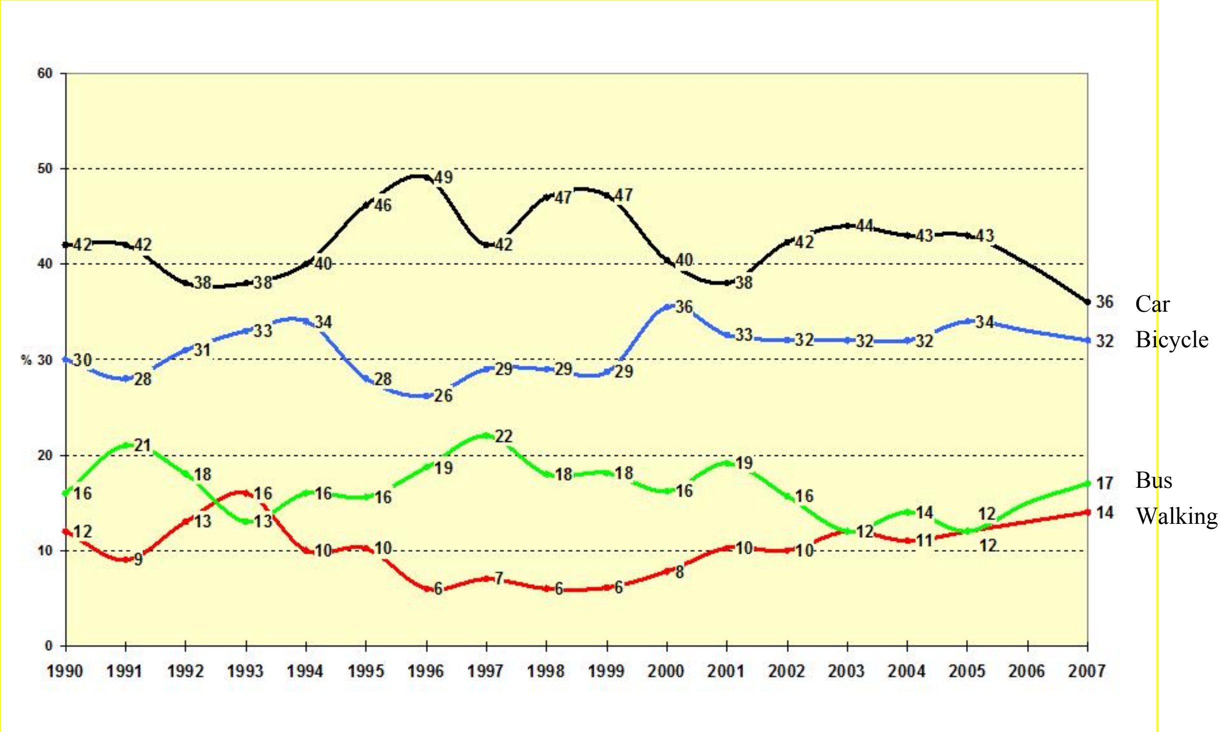
There is a danger that economic considerations could make soft measures an attractive alternative to capital spending. However, ‘hard’ measures are an essential component of a transport strategy. What SMILE has been able to demonstrate is that it is the behavioural impact of hard measures in changing attitudes and behaviours that is important.

4.1.7 Social And Behavioural Effects: Modal Shift

As mentioned above, SMILE documents highlight the importance placed by government on reducing car journeys and particularly single occupancy journeys. This is also reflected in the Traffic Environmental Programme for the City of Malmö. All of the SMILE measure groups, except clean fuel group, imply some kind of impact towards sustainable modal shift, as will be discussed in detail in the following sections.

Figure 4.1.4 illustrates the only ongoing modal split results that are comparable over time and available to us for Malmö. (The survey results presented in the evaluation reports at the measure level are not directly comparable over time due to differences in the sample characteristics, the survey method (and questions) and the sample size. The sample size is too small for statistical conclusions to be drawn, but is useful to allow a general assessment of trends. Car use has gone down by 7% from 2005 to 2007, when it reached its lowest point of 36% for the last 18 years. There is also a comparable increase in bus use of 5% for the same period (2005 to 2007), suggesting that the majority of those who shifted from car use went towards bus use. These are very significant effects that might not be wholly attributed to SMILE or other transport policies within the city. The soaring fuel prices might be a factor here (as it will be discussed more under the economic section), which might also be reflected in the highest percentage of walking trips in 2007 attained over the last 15 years.

It is interesting that prior to 2005, the percentages of walking and bus use generally moved in opposite directions (maybe weather is a factor here). After 2005, the percentages of these two modes increase simultaneously (for more than two years in a row). Cycle use seems fairly stable since 2001, having a share steadily above 30%. As one can see in Figure 4.1.4 cycle share has always been very high and at times (2000 and 2007) it closed to within 4% of the car share. One would not expect to see any significant effects from the cycle related SMILE measures (8.3 and 12.4) as early as 2007.



(Source: Skånetrafiken, annual telephone survey of 500 people, for work/school trips during the winter season)

Figure 4.1.4: Modal Split in the wider area of Malmö (main transport mode per person)

Table 4.1.4 illustrates the trend in bus passengers from 2004 to 2007 in Malmö and is broadly in agreement with Figure 4.1.4. The bus patronage increase in Table 4.1.4 is a combination of the bus related SMILE measures (8.1, 12.1, 12.3 and 12.7), the increasing trend in bus journeys, the effect of the new bus routes (and its marketing though Measure 8.1) and the mostly indirect effects of the behaviour change measure group (by encouraging sustainable transport). Hence, it is impossible at this stage to distinguish a quantitative effect for each of the individual measures, but we think that the majority of patronage increase can be attributed to the "bus measures" cluster (8.1, 8.2, 12.1, 12.3 and 12.7).

Table 4.1.4: The Trend PT Passengers from 2004-07 in Malmö

Time period	Number of passengers	Increase
Jan-04 to Dec-04	25 133 891	--------
Jan-05 to Dec-05	25 407 269	1,09%
Jan-06 to Dec-06	27 319 571	7,53%
Jan-07 to Dec-07	29 163 239	6,75%

Source: Skånetrafiken

The "Bus Measures", 8.3 (Marketing new bus routes), 8.2 (Security on buses), 12.1 (Real-time Information) 12.3 (Mobile Internet Bus Information) and 12.7 (Bus Priority), whilst being attributed most of the bus patronage increase, will also have a long term effect on traffic volumes by making bus travel more attractive and encouraging people to use it instead of cars.

Measure 12.2 (Traffic Monitoring) is not expected to have had significant effects on Modal Shift and is not included in this analysis since the "system was probably not working optimally" during the test period.

The Behaviour Change Measure Group is expected to produce positive effects from encouraging shift towards sustainable transport modes. Measure 11.1 (Mobility Management) is an example of such activity, focused on changing people's transport behaviour through its many relevant campaigns. However, there are some measures in this group that might exhibit antagonistic effects. For example, Measure 7.1 (Marketing clean vehicles by subsidized parking) offer of (one hour) free parking to clean vehicles' might increase car usage (even if the cars are "clean"). We also need to repeat here that Measure 9.1 (car-club) aimed to reduce car use by offering alternatives to car ownership, but, the results in the evaluation report indicate an unexpected increased car use.

The cycling related SMILE measures (8.3 and 12.4) do have an effect towards sustainable modal shift, since they make cycling more appealing. Furthermore, measure 8.3 makes car travel "actively" less appealing than cycling, by providing priority to cyclists over road traffic in the crossings. Malmö had highly developed cycling facilities and the City of Malmö's "Cycle Program" implemented since 1996 has been intensively promoting cycling. Hence, the magnitude of the effect on modal shift for the two SMILE measures is expected to be very small (given the very high cycling share).

4.1.8 Social And Behavioural Effects: Cycling

With 410 km of bicycle lanes, an ambitious Cycle Program, a climate and topography well suited for bicycle traffic, coupled with the fact that most residents (over 90 %) in Malmö have a bicycle at their disposal it is clear that Malmö is a leading European city in terms of the infrastructure to enable bicycle use. Prior to SMILE more than 20% of all journeys in Malmö were done by bicycle, and for journeys to and from work the figure was even higher.

The Malmö City government began promoting bicycles as an important mode of transport after 1996, when the "Cycle Program" was first published. The main focus in the Program was the construction and expansion of a complex network of straight and safe bicycle lanes, secure and centrally located parking facilities, along with information activities and campaigns. Free bicycle maps have been available since 1965 and after 1995 these maps have been updated more frequently. Recently the maps have become available on the Internet (see measure 12.4) and in conjunction with travel planner facilities. This will not only make cycling more accessible, but also the travel planner connects cycling to other transport modes.

As mentioned previously, measure 8.3 was designed to make cycling more appealing by giving priority to cyclists over road traffic in intersections with radar detectors. However, measure 8.3 was initially designed to fit in with the new rail stations and the new city tunnel, but this was not implemented within the SMILE timeframe. Nevertheless, the planning, market research, and consultation with the other municipality departments and eternal organisation were completed. The same is true for the measure handbook, the concept book and technical studies that have already been used in planning the three new rail stations. The interviewees indicated that the indoor cycle parking garages will be the largest in southern Sweden, holding over 1000 cycles at each station. Through the analysis of surveys conducted on cyclists, they will offer services, ranging from cycle rental to shopping facilities. These initiatives will significantly improve both cycling facilities and appeal, along with improvements to the connectivity with other public transport modes, making cycling practical and desirable to a larger part of the population, and for commuters to Copenhagen.

Measure 11.1 (Mobility Management) also promoted intensively cycling through a variety of campaigns during the whole SMILE timeframe. The campaigns relevant to cycling were:

- Companies on Bikes
- Learning to Ride a Bike
- Famous People Who've Biked in Malmö

- 'Walk and Bike to School' that later became 'Friendly Way to School'

Most of these initiatives were very successful, as shown the in the Measure 11.1 Evaluation report. As underlined in the interviews, measure 8.3 was also promoted through the campaigns shown above, demonstrating a high degree of cooperation between the measure leaders and personnel. This cooperation and the multiple initiatives targeted at cycling have produced and will continue producing significant cumulative effects that come with increased cycle use (i.e. health benefits, less congestion, improved local air quality, less GHG emissions).

4.1.9 Social And Behavioural Effects: Walking

There is a general presumption amongst the behaviour change measures that they will result in increased levels of walking. This is achieved through "awareness raising", through making options other than car travel easier or, in some instances, making the environmental costs of car travel more obvious and therefore encouraging other modes for particular journeys. However, not many measures actively undertake initiatives to promoted walking.

Measure 11.1 did include two campaigns that were mainly concerned with walking, along with promoting walking where possible though the remaining campaigns. The first initiative was called "Path Choices" and delivered the message of walking being an advantageous alternative to private cars for a short distance trips.

The other relevant campaign was initially called "Walk and Bike to School" that was later replaced by the "Friendly Way to School". During the interviews it was indicated that schools are quite a fertile area for promoting sustainable transport and in particular walking and cycling, with children being in the vanguard for accepting such changes. The interviewees said that many parents initially found the idea of leaving their car and walking their child to school difficult. To counter this and to engage the children, they had a big map of Europe and when the children walked to school, footprints were generated on the map towards a destination, be it Paris or Rome (or any European City they choose). When they reached a city in the map, various activities were organised, for example reaching Rome might mean that the children had pizza for lunch. A "giraffe mascot" was also used to get the children accepting and having fun with the activities. The result of the initiative was that children actually managed to influence their parents not to ferry them to school by car, because they wanted to have another footstep on the map though walking to school. This is an excellent example of promoting sustainable modal shift and influencing the core and the future of the community.

Measure 9.1 (the car-club) sought to give people alternatives to car ownership, thus encouraging trips with other transport modes. In the discussion of this measure and according to their survey results, the car club membership did not necessarily encourage the use of other transport modes (cycle and bus/tram). However, even in those circumstances, walking distance increased for the car-club members. This is quite reasonable, since using the car-club for very small trips is impractical and costly; there is also the walking distance to and from the "car pool" location that needs to be considered. Given these points, it can be safely inferred that Measure 9.1 resulted in increased walking for its participants, who accrued the health benefits of this activity increase.

It is noted that the effects of the Norwich car-club measure were the opposite of Malmö, reducing walking distances for the participants (but increasing the use of all other transport modes in relation to car travel). This might be partly attributed to car-club and car-sharing measures running in parallel (or in conjunction) in Norwich, which is not the case for Malmö.

4.1.10 Economic Effects

The wider economy is important for measures in determining whether they can be implemented as intended. It must also be taken into account in assessing whether the impact seen was due to the measure or the wider economy. This can be demonstrated most readily in relation to modal split. As has been seen, a number of measures sought to make public transport more attractive than car driving. Other measures such as car club and car sharing also sought to create viable alternatives to owning and driving a car, particularly for single occupancy journeys.

The implementation of the measures coincided with a period of rapid increase in fuel prices. The effect of the rapid increase in fossil fuel prices was stressed by the interviewees (in August 2008). This was in response to questions about factors that influenced the measure impacts and the evaluation of these results. It was pointed out that the increase in fuel prices may have reinforced or even triggered behavioural change in people, who might have regarded car travel as unnecessary and uneconomic at the time.

However, the oil price has dropped significantly and is on very low levels at the moment (February 2009), whereas another economic situation, recession, has arisen. It is noted that much of the effect of soaring fuel prices on the public's behaviour has probably dissipated. This may have had some effect on the evaluation results, measured previously. The magnitude of such effect is not quantifiable at the moment.

The implications of recession are many and significant, but we are uncertain at the moment on how exactly the SMILE measures' future operation and results are affected. We expect that there will be plenty of research in the near future, examining the effects of economic recession in sustainable transport policies.

Notwithstanding this overarching issue, economic effects were chosen as an indicator of the impact of many measures. The indicators often related to the economic benefits for individuals or companies taking part in the measure. These were typically expressed in terms of fuel economy. In other cases the focus of economic consideration was the cost of taking part in the measure (e.g. cost of retro-fitted vehicles to make them more environmentally friendly).

Given the difficulty and incompleteness of economic assessment within individual measures, it has not been possible to make an overall quantitative assessment of the direct economic (or even "financial") impact of the SMILE measures. Furthermore, to our knowledge there are no cumulative effects here from a pure financial perspective (the level of information required for assessing the overall effects of SMILE Measures to the wider economy of the area is forbidding, even in the best case scenario of data availability).

Capturing the full economic benefit of these transport measures requires the inclusion of the user benefits that come in the form of travel time reductions. A first step towards this was made in Malmö by conducting stated preference experiments that would calculate the value of time for different groups of bus users. However, there are some questions about the value of what was quite a general analysis, with respect to the reporting and the statistical significance of the SP results. Furthermore, there are no robust data on travel time reductions stemming from the SMILE measures, therefore it not possible at this stage to calculate accurately user benefits from travel time reductions.

4.2 Norwich

4.2.1 Context

Norwich was one of the lead cities in CIVITAS SMILE and undertook 17 interlinked measures as part of the project. In this section we consider the overall impact of the measures in SMILE and their interrelationship with related issues which may have impacted upon the SMILE measures in terms of panning, implementation or effectiveness, or vice versa. Such related issues include the Local Transport Plan, transport strategies and planning policy, particularly where spatial planning interacts with transport, for example, through the Supplementary Planning Document on Developer Contributions.

The Strategic Context for Transport Planning in Norwich

Norwich City Council notes that the most important national guidance in relation to planning for transport is PPG 13 (2001) and that Circular 05/2005 highlights the need to set out the nature and scope of developer contributions to transport improvement. Regionally, the key strategic document is the Draft Regional Spatial Strategy (RSS) for the South East of England (2004), particularly Chapter 8: the Regional Transport Strategy. RSS policy IMP1 seeks to achieve close co-ordination between new development and transport infrastructure, improved demand management and transportation modal shift. Norfolk County Council's Norwich Area Transportation Strategy (NATS), Policy 8, states increased demand for transport should be met by means other than the car. NATS also states that developers should contribute to sustainable transport choices at development sites. NATS makes explicit links to the RSS:

- Recognition of Norwich as a centre for growth, probably including a major urban extension. NATS seeks to provide essential infrastructure to accommodate this growth.
- Supporting the Norwich Area as a sustainable community e.g. measures to promote a high quality urban experience, reduce traffic and extend pedestrian dominance of city centre.
- Supporting Norwich's role as a Regional Interchange Centre – improving role as interchange, links with other urban areas and improving interchange in the city between different modes.
- Promoting travel choice.

The full range of relevant policy documents is set out in table 4.2.1. Subsequently some of the key local documents and their impacts are summarised.

Local Transport Plan (LTP) 2006-2011 (Norfolk County Council)

The LTP sets out the long term strategy for transport to 2021 and a 5 year implementation plan. It sets out a vision of Norfolk as a well connected place, known as a national leader in making transport safer and reducing transport's impact on climate change and the wider environment. It covers a variety of thematic strategies across the county which are then taken forward in the local context of a number of Area Strategies including one for the Norwich Sub-region. The thematic strategies are:

- Delivering sustainable growth - Integrating spatial, economic and transport planning
- Improving accessibility
- Reducing congestion

- Protecting and enhancing the environment
- Improving road safety

Table 4.2.1: The Main Policy Documents Relevant to Norwich

Document	Date	Responsible authority	Purpose
Transport White Paper: The Future of Transport 2030.	2004	UK Government Department for Transport	Provide national policy framework – allows local authorities to plan with more certainty.
Draft East of England Development Plan and Regional Transport Strategy 2001/21	2006	SE England regional Assembly	Sets out regional strategy: vision, scale of change, key policies.
Norfolk County Council Local Transport Plan	2006	Norfolk CC – this is a joint plan with Norwich CC and other local authorities within the county	Legal requirement to produce with annual monitoring reports to DfT, who provide scheme funding. It includes area strategies and other documents such as multi-modal studies of major schemes.
Local transport plan	2001	Norfolk CC	Legal requirement to produce with annual monitoring reports to DfT, who provide scheme funding
Norwich Area Transportation Strategy NATS4	2006	This is part of the LTP focusing on Norwich and is a joint document between Norfolk and Norwich.	It sets out all of the LTP plans for the Norwich area and includes technical support/ policy justification for policies.
Area Transport Action Plans		Included in NATS	
Norwich City Council Replacement Local Plan	2004	Norwich CC	Legal requirement to produce and use in development permission decisions
Supplementary Planning Document: Transport Contributions	2006 draft	Norwich CC	To inform developer contributions in new (major) development proposals

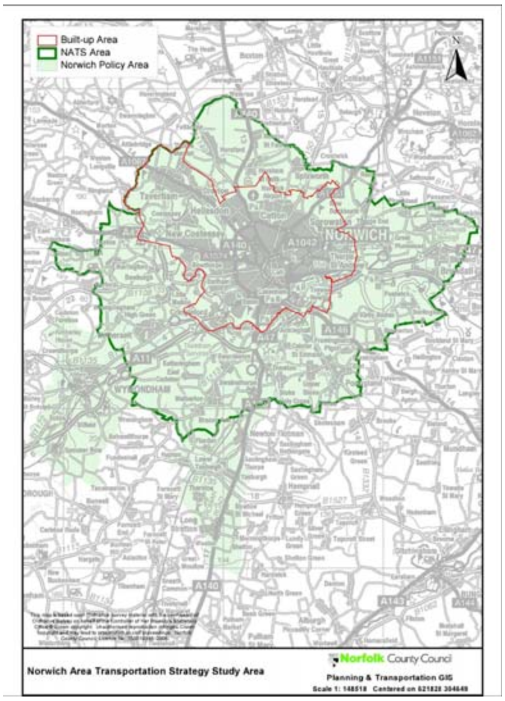
The Norwich Area Transportation Strategy (NATS) is therefore part of the Local Transport Plan prepared by Norfolk County Council. Norwich City Council describes it as a joint strategy with Norfolk County Council. NATS4 sets out detailed transport policy and provides the framework for investment based on the Local Transport Plan objectives.

Norwich Area Transportation Strategy (NATS)

A revised NATS was produced in 2004 (NATS4), replacing previous versions and published as Norwich Area Transportation Strategy 2006. This sets out a framework for decision making to 2025. The NATS covers the area shown in figure 4.2.1.

The Norfolk County Council website summarises aims and achievements as providing easy access, meeting needs and maintaining the economic health of the city. It aims to ensure journeys are sustainable and to minimise adverse effects on health and on the enjoyment of the city including its historical and natural environment. This is to be achieved by encouraging people to get to the city without using cars and improving facilities for other modes including through park and ride facilities.

It also encourages alternative modes of transport in new schemes and tackling accidents and environmental impacts of traffic.



Source: Norwich County Council,

http://www.norfolk.gov.uk/consumption/groups/public/documents/article/ncc049932.pdf

Figure 4.2.1: The NATS Area

The County's website states that targets have already been met to increase public transport use, reduce injuries and deaths in traffic accidents, promote the city as a shopping location and reduce the number of cars coming into the city (Norfolk County Council). The transport strategy recognises that there will be growth in Norwich and plans to address problems such as congestion, which will be associated with this growth. It builds on previous policies of accommodating increased trips by means other than car. NATS identifies 80 policies and an Action Plan for their delivery.

NATS4 (2006) makes no specific reference to CIVITAS SMILE. However, of the full list of 80 policies, many have potential links to SMILE measures.

The Executive Summary highlights particular measures as key elements of the transport strategy:

- A new Northern Distributor Road.
- Traffic management initiatives in residential and minor rural roads around the north of Norwich to "lock in the benefits from a new road" (NATS, p25, para 3.13),
- Extension of the pedestrian dominated area in the city centre – initially traffic management on essential routes but in long term removal of through traffic from the city centre,
- Point 2 is likely to be possible only if there are further improvements to the Inner Ring Road and delivery of Northern Distributor mentioned in 1,
- Define a Road Hierarchy to prioritise e.g. pedestrians in the city centre and put traffic on the main roads. Congestion will be tackled through efficient use of the road network and intensive implementation of soft measures,
- Expansion of Park & Ride will be considered.

and states that the NATS seeks to:

- Improve accessibility for all by increasing travel choice.
- Monitor and reduce congestion – including revision to the mode hierarchy, improving main routes to tackle congestion and improving the efficiency of the network and intensive development of soft measures such as travel planning and personalised journey planning.
- Tackling pollution – through traffic management, clean fuels and less polluting driving methods, minimising and mitigating impact of infrastructure on townscape, landscape water etc.
- Improve safety.
- Promote economic vitality through meshing infrastructure including a heavy goods vehicle route with the objectives of the draft RSS.
- Liveability and Community will be taken into account by recognising the need for good design reducing crime and fear crime associated with transport infrastructure, and tackling social exclusion through improved access.

City of Norwich Replacement Local Plan (Adopted 30th November 2004)

This section of the report considers the Local Plan and how SMILE measures relate to planning policies. There is little reference to CIVITAS SMILE in the Local Plan but as will be seen, there is a large degree of consistency between the Plan objectives and SMILE measures.

The Local Plan highlights transport and traffic management as "probably the most difficult and challenging issues facing the city" (para 11.1). Traffic levels in Norwich are expected to increase by 30% by 2016 but change is necessary to improve the quality of life for the 30% of households in Norwich without access to a car. Although most journeys are by car, the Local Plan notes that the compact nature of the city gives opportunities for a modal shift.

The main strategic transport objective (SOBJ6) is to promote a well connected City, and this needs to be matched by ensuring resources are used in a sustainable manner (SOBJ8). In addition to the Local Plan, other key policy documents developed in Norwich include the City Centre Transport Plan (CCTP) and the Transport Contributions SPD which are discussed later.

Transport policy in Norwich draws on consultation carried out in 1999 and 2000. Issues raised in that consultation are highlighted in the Local Plan and where appropriate comment is made below on their relation with SMILE:

- Concerns and solutions to the problem of bus interchange (discussed in the CCTP, and relevant to SMILE measure 8.4);
- Desire to accommodate car trips to the City Centre for the benefit of business (CCTP issue)
- Attention to the needs of pedestrians a priority (SMILE measure 6.3 is an innovative approach to this issue in a particular area);
- Concern about the pace of change in traffic planning, in terms of the effects on congestion, assumptions about diversion of trips, publicity for changes, and enforcement capability (CCTP issues in the main and these seem to underpin several SMILE measures);
- Cheap and reliable public transport is essential to provision of accessibility for development (SMILE measures 8.4, 8.5, 8.6 and 12.9 address the issue of making public transport more attractive and accessible);

- Support for safer residential environments throughout the City with Home Zones, speed restrictions and other traffic management measures (Home Zones don't appear to be picked up in SMILE measures, but measure 7.2 is partly aimed at improving the environment in residential areas);
- Parking standards should be set as maximum levels and reduced for main accessible areas (SMILE measure 7.2 may have impact on this issue);
- Need for a high quality cycle network for the City, which is safe and attractive for more cyclists (does not appear a particular focus of SMILE but could have been compatible with SMILE programme).

Norwich City Council Transport Contributions Draft SPD

The Norwich City Council Replacement Local Plan (Norwich CC, 2004a), policies TRA10 and TRA11, seeks to ensure that new development is accessible to all modes of transport including rail and water (if appropriate). Norwich City Council website (Norwich CC, 2006a) highlights a Transport Contributions Supplementary Planning Document, which clarifies how these policies will be implemented. The SPD notes that developers will have to provide off-site works to integrate with multi-modal transport and contribute to mitigation of the wider impacts of their development.

It is also noted that if the development is accessible or likely to become easily accessible to modes other than car, levels of mitigation are likely to be lower. (p2) Thus a link is being made between planning and transport in making it clear that development costs in inaccessible locations will be higher. However, the level of contributions necessary for residential development under policy TRA11 are described as modest (NCC 2006a, p8).

Policy TRA10 relates to provision of access to choice of non-car transport options. This includes, for example, providing access to existing footpaths and making access to bus stops as convenient as possible. Where development is in or on the edge of CPZs, developers are also expected to fund extension of Controlled Parking Zones to new streets through a section 106 agreement.

Transport Assessment is required for any developments which will generate major amounts of transport activity, including smaller developments in congested city centre areas (Norwich CC, 2006a). The amount of contribution toward meeting policy TRA10 will count towards TRA11 contribution but if it exceeds that contribution, the cost will still have to be met in full by the developer.

In pursuing the objective of modal shift, Norwich CC (2006a) costs the removal a of a car trip at the price of providing a Park & Ride space (£3,800 in May 2005). The contribution can be spent in a number of ways determined through the transport assessment. The proportion of journeys made by car is assumed to be different in different city locations and for different land-uses and this influences the total contribution from a site. Using this methodology, it was estimated that a 1000m2 city centre office development would require a transport contribution of £62,700 (Norwich CC, 2006a, p17).

Policy TRA12 requires that Travel Plans are integral parts of many development proposals. SMILE measure 11.3 aims to develop travel plans in relation to existing schools and workplaces, initially with schools in a sector of the city. TRA12 and SMILE measure 11.3 can therefore be seen as complementary. Where new residential development is in city centre areas, the council will seek additional support for its area Transport Action Plans (as detailed in policy TRA25).

4.2.2 Environmental Effects: Energy Efficiency and CO_2 Emissions

Reduced energy use has a variety of positive benefits including reduced depletion of resources and possibly also reduced cost. However, from a local policy perspective the principle motivation for reducing energy use is the impact in reducing greenhouse gas (GHG) emissions. Thus, the objectives of reducing energy use and reducing GHG emissions such as CO_2 can be considered as having synergistic effects. This section therefore also analyses the impact of the SMILE measures on CO_2 emissions. This is followed by a section which goes on to consider other emissions and pollutants such as NOx and particulate matter.

Central and local government policies, including the Traffic Management Act (2004), the Transport White Paper (2003), the East of England Development Plan and Regional Strategy, the Norwich Area Transportation Strategy (2006 - NATS4) and the Local Transport Plan 2006-2011 promote modal shift and the use of clean vehicles and fuels. There are particularly strong links between the SMILE measures and NATS4 where the measures go some way towards providing mechanisms for implementing policy.

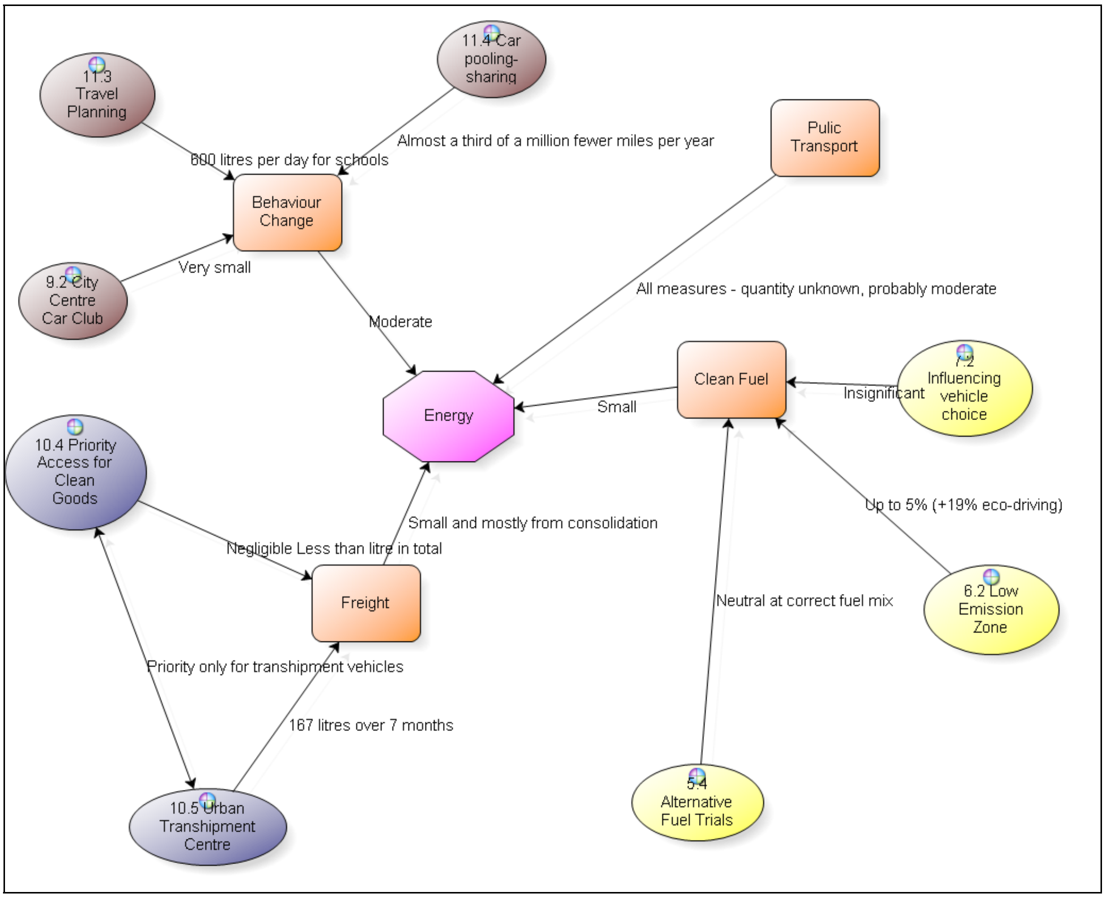


Figure 4.2.2: SMILE Measures in Norwich Impacting on Energy

Figure 4.2.2 indicates that most SMILE measures have an impact on energy use. Several measures, such as those in the Public Transport group, do not explicitly set energy reduction as a target, but reduced energy use will result from their objective of encouraging modal shift towards public transport. A variety of quantitative assessments of energy reduction are made in relation to other measures, e.g. reduction in litres of fuel used, percentage reduction in fuel or reduced mileage. Details of the impact on energy use by each measure are discussed in the following paragraphs.

Clean Fuel Measures

One of the groups of measures in Norwich relates specifically to clean fuel. Measure 5.4 Clean Vehicle Trials compared a number of different fuel sources for a range of vehicle types. The main objective of this measure was to demonstrate the technical feasibility of a range of biodiesel blends where there had been perceived barriers to this in the UK. Detailed discussion of effect on emissions other than CO_2 is included elsewhere in this chapter. In addition to evaluating effects on CO_2 and other emissions, an important feature of this measure was to include consideration of total fuel consumption of different fuels and fuel blends. This is important because, notwithstanding the relative litre for litre comparison of GHG emissions from different fuels, there is a relationship between the total amount of a particular fuel used and the emissions resulting from that usage. Measure 5.4 used a robust methodology to compare the influence on emissions of bio fuel blends, fuel economy and driver behaviour.

The measure sought to introduce a variety of blends of biodiesel in a number of public transport, public service, private hire and taxi fleets. As discussed in chapter 3, the numbers and range of vehicles included changed during the delivery of the measure. In addition to demonstrating the technical feasibility of introducing the range of biodiesel mixes, the measure provided important information on the actual effect on CO_2 and other emissions of different blends in urban areas. In addition to any direct benefit arising from the measure in terms of impact on the environment in Norwich, the measure sought to provide evidence which would give confidence to operators and authorities which would inform their practice in future. Buses using biodiesel travelled through the Low Emission Zone (measure 6.2) and this allowed additional measurement of emissions in that area.

A life cycle approach to the assessment of greenhouse gas by manufacture and use of the fuels was taken. The measure template notes that this is “reported on comparatively as CO_2 equivalent emitted per vehicle km” in addition to overall reporting of the impact of the measure on fuel use.

A baseline position was established using recognised assessments of the GHG lifecycle emissions of mineral diesel. In addition to suppliers’ specification, the measure substantiated emissions from fuels though testing. The results template does not specifically include data on actual CO_2 emissions savings achieved during the trial. However, equivalent analysis carried out by the supplier, Argent, adjusted to take into account the specific circumstances of the Norwich trial, implies that savings may be around 17% using B20, and the annual savings for Anglian Bus would be around 600 tonnes of CO_2 equivalent per year. Estimates for savings for First Bus using a B5 mix would be around 2%. As noted in chapter 3, however, the main benefit of the measure relates to enhancing knowledge and assisting the local authorities to attain a leading position in future low carbon development. In addition, links with Malmö developed during SMILE point towards technologies such as biogas as a potential way forward in low carbon fuels.

Measure 5.4 found that overall fuel efficiency did not change significantly between B0 and B20 mixes. However, at B100 there was a 10% reduction in fuel efficiency compared with B0[13]. Taking into account a variety of considerations, the results report concluded that a B20 blend might be the appropriate compromise which produces the optimum mix of results across indicators including CO_2 emissions. However, interviews with staff at Norfolk County Council highlighted that solutions also have a political element. At the time of interview, the UK Bus Service Operators’ Grant (a national scheme operated by the UK government to rebate the fuel duty paid on diesel fuel by the operators of local bus services as a financial incentive to public transport) was not favourable for anything greater than a 5% mix. In this case, it could be hoped that dissemination of the results of the trial in Norwich could help inform national policy, particularly as a consultation on the future of Bus Service Operators’ Grant was underway.

[13] Consistently with the general robust approach within this measure, the results report expressed a desire to carry out more research into the apparent reduced efficiency at B100.

Measure 6.2, the Low Emission Zone (LEZ), assessed fuel efficiency and cost per km. The measure featured the use of real time analysis of CO_2 and other emissions, but emissions other than CO_2 were the main focus of the measure. It was found that the LEZ conditions including turning off engines and limiting access to more efficient vehicles reduced fuel consumption by 3-5%. Eco-driving training is being undertaken and is estimated to have the potential to create on average an additional 19% in fuel savings.

Measure 6.2 highlighted the importance of measures which result in a “win-win” situation where air quality is improved by reduction in pollutants in a way which also minimises GHG emissions and is beneficial in terms of climate change. Both measures 6.2 and 5.4 demonstrated that this can be done, but that it requires a holistic approach and that methodological difficulties have to be addressed. This points to the need for a systematic approach to evaluation to be put in place at the outset of a programme of measures.

Measure 7.2 uses Controlled Parking Zones (CPZ) to influence behaviour. It aims to encourage the use of smaller and more fuel efficient vehicles through incentives related to resident and business parking. Although the intention is to encourage the use of fuel efficient vehicles, implementation of this measure is complicated by a number of factors. It is not possible to use engine size directly as a measure of fuel efficiency since different models of car vary in how polluting they are in ways which don’t always reflect engine size directly. In addition to inherent differences between the vehicles, other factors including age and condition will also influence fuel efficiency.

It is notable that the central government approach to encouraging cleaner more efficient vehicles does use size of engine as a proxy through reduced vehicle tax for smaller engine sizes. This may reflect differential access to data for local and central government but the local approach is also consistent with additional measure objectives since measure 7.2 also seeks to increase the number of vehicles which can park in a constrained amount of kerb space through influencing decisions on vehicle length. This ties in closely with the objectives of NATS policy 36, Parking in Residential Areas.

Making use of clean vehicles rather than just less damaging conventional vehicles was an objective of 7.2 which clearly works in direct parallel with 5.4 in that it will increase the number of vehicles using clean fuel. Measure 7.2 gives the highest incentive possible to clean vehicles by giving a 100% discount for resident parking for alternative fuel vehicle private cars.

The measure would be expected to influence the choice of replacement vehicles rather than being sufficient to make someone change their vehicle, so this change was seen as a long term goal. Measure 7.2 included CO_2 emissions as an indicator of impact on the environment. It derived estimates of carbon emission savings from records of engine size held by the council in relation to a parking permit database combined with the government’s estimates of fuel use on the Vehicle Certification Agency database. The measure evaluation template recognises that this approach does not adequately explain variation in fuel use or CO_2 emissions but nevertheless uses it as a basis for calculation. This pragmatic approach is understandable give the complexity and cost of achieving a better estimate.

Derived figures from the council database of engine size of vehicles with permits indicates that to date the measure has had an insignificant impact on vehicle ownership and therefore on emissions. In the longer term it is suggested the impact of this measure could be greater. For example, a change in the average length of vehicle of 5% and 10% suggests potential for reductions of 1413 and 2742 tonnes of CO_2 per year. However, if car size reduced and the number of cars which could park increased proportionately, the impact on CO_2 emissions would be reduced to 303 and 516 tonnes per annum respectively.

Measures which do not primarily involve behavioural change, can have an impact on behaviour, for example, by raising awareness of issues. Influencing the choice of vehicles towards smaller and cleaner vehicles has a demonstration effect, which may be more important than the specific reduction in energy use created directly by the measure. While this measure has the longer term of creating a cleaner vehicle fleet in the city as it influences choice in renewing vehicles, there may be greater benefit in having a critical mass of measures which get fuel efficiency and environmental issues into people's minds; one of the objectives of 7.2 is to "raise public awareness and perception of advantages of purchasing/leasing fuel efficient vehicles." This is very similar to one of 5.4 Clean Fuel objectives to "increase citizens' awareness of clean fuels and vehicles." Unfortunately, survey results for measure 7.2 suggest that this change of public perception of the benefits of owning or leasing smaller more fuel efficient vehicles has not yet occurred.

Freight Measures

Measure 10.4 Urban Priority for Clean Freight Vehicles worked synergistically with measure 10.3 Freight Stakeholders Club and measure 10.5 Freight Consolidation Centre. A mix of surveys of vehicles using bus lanes and derived measures of fuel efficiency were intended to indicate the extent to which fuel use had decreased. Initially, it had been hoped to introduce incentives such as access to bus lanes for biofuelled or cleaner freight vehicles. However, these incentives in SMILE did not prove to be significant motivation to get freight operators to change their fleets to cleaner vehicles.

A second objective was to reduce the number and size of vehicles delivering into Norwich and urban priority routes were used over this period for vehicles which took goods deposited at a transhipment centre (which was established as an objective of measure 10.5) to the city centre. Fuel savings were achieved because smaller vehicles using priority lanes were more fuel efficient. In practice the savings were very small because low take-up meant that very few journeys were made by these vehicles.

Freight measures 10.4 and 10.5 sought to reduce emissions through encouraging fewer journeys into the city centre by heavy vehicles (through consolidation at the transhipment centre). Goods were to be transferred to less polluting vehicles which could use priority access and therefore spend less time in congested traffic. A positive impact on the environment would be indicated by reduced CO_2 as a result of reduced energy use.

The consolidation centre is located approximately 20 miles south west of Norwich on the A11 and the bus lanes open to the consolidation centre vehicles are on this route. The freight measures put in place a fairly robust method of obtaining a derived measure of fuel use, based on the length of journey time spent in congested and free moving traffic and linked to the type of vehicles in use.

The number of vehicles and shops involved, and therefore the fuel economy resulting from this, was very small indeed. Concern over the use of bus lanes limited their use to the small number of transhipment vehicles and a total of only 50 journeys over the SMILE evaluation period. The impact on emissions was therefore very small and made an insignificant difference, with a saving of less than one metric tonne of CO_2 over the year. The use of the bus lanes (measure 10.4) made virtually no difference to emission levels. From November 2007 to June 2008, 167 litres of fuel were saved over a 7 month period by using smaller vehicles from the consolidation centre and use of bus lanes saved less than a litre of fuel over the period. Using optimum assumptions for expansion of the initiatives, the potential for increased fuel saving are claimed to be very significant. The challenge will be how to achieve these savings in Norwich – development of other similar schemes continues elsewhere in the UK.

The development of a freight stakeholders club, as attempted by measure 10.3, could help to facilitate increased use of the consolidation centre. However, this measure was not very successful and, as discussed in Chapter 3, the freight stakeholders club was barely constituted and the access to transport information limited to a demonstration project. It is noted in discussion with measure leaders, and in the results reports, that expansion of other measures to make it difficult for larger vehicles to deliver to the city centre e.g. expansion of schemes such as the LEZ (measure 6.2) could have a significant impact on increasing use of the consolidation centre.

Measure 12.8 Customised Traffic and Travel Information for Freight Operators aimed to provide useful transport information to participating clean freight carriers which adopted clean transportation principles. 12.8 would also reduce fuel use and emissions by allowing carriers to avoid congestion. In practice, the incentive of providing improved information to operators, e.g. on traffic management issues, congestion, parking and road conditions proved insufficient to encourage retro-fitting fleets with pollution reducing equipment as this was too expensive and eligibility criteria were watered down to include only participation in eco-driving classes. The measure was implemented as a demonstration project which piloted the use of technology with only two companies rather than being applied more broadly.

Whilst lessons were learnt from measures 10.3 and 12.8, there has been only a very slight impact on emissions of CO_2. Eco-driving training for the two companies involved in measure 12.8 will have had a small impact, but the evaluation was amended to a qualitative methodology and no figures are therefore available. No actual measurements of fuel use reduction were made by the measure.

Behavioural Change Measures

Travel Planning (measure 11.3) influenced mode of transport. The measure did not include direct measurement of fuel savings as an indicator, but extrapolated fuel savings from the modal shift achieved in schools and workplaces.

- The 88 school travel plans collectively exceeded the target of 5% reduction in single occupancy vehicles, delivering a 10.9 % modal shift. The fuel and CO_2 savings per annum respectively were 514,332 litres and 1134 tonnes.
- Of the 20 workplace travel plans, data available from four showed a 10.75% reduction in single occupancy vehicles travelling to the establishments.

As discussed above, there are good pragmatic reasons for this approach. Detailed measurement would have been expensive and the major achievement of this measure is to influence behaviour which will have a positive impact on the damaging effects of unsustainable transport. As mentioned by the measure leader at interview, and repeated in the measure template, there are a number of drivers for organisations adopting a more sustainable approach including congestion, healthy lifestyle and concern for the environment. Achieving sustained change in behaviour is the key to success and quantification of impacts beyond modal shift is of secondary importance to the measure.

As mentioned in the Evaluation Template, the measures may contribute to UK National Indicators 186 "per capita reduction in CO_2" and 188 "adapting to climate change" and a systematic approach to estimating CO_2 contribution of measures across programmes such as SMILE might allow better data to be available for local authority-wide analysis.

This is not to say that the broad understanding of impact on CO_2 emissions of different behaviours should not be examined at the measure level. For example, the measure template helpfully points out that the use of a shuttle bus by a company did not reduce CO_2 emissions since it displaced parking to a new location but it did result in reduced congestion at the premises. It is easy to see why detailed calculation of the difference in car mileages to the two locations would not be a good use of resources as this is only one of many sites involved, but an understanding of the travel patterns to each location could indicate the extent of CO_2 savings. Such an estimate could be useful in determining the choice of location for Park and Ride facilities where a choice of sites existed.

Measure 9.2 City Car Club included an indicator of reduced fuel used per kilometre travelled. This was to be achieved by purchasing cars which were significantly more fuel efficient than the UK average. The cars used by the car club also had lower emission rates than the UK average, although some compromise had to be made between maximising fuel efficiency and giving a choice to car club members. If the choice was too restricted, there were concerns that this would reduce the attractiveness of the scheme and run counter to its objectives.

Measure 9.2 also included a derived quantitative measure of CO_2 emissions per vehicle km as an indicator. The baseline against which this is measured is the VCA estimate of fuel use by cars registered in Norwich. CO_2 impact is estimated from the combination of lower emissions and changed behaviour, i.e. reduced mileage shown in surveys of car club members.

In discussing the Business as Usual scenario for measure 9.2, the measure template suggests that club members would have retained an existing car or bought a new one if the car club had not been there. A further alternative would have been that they would have done without a car, indeed, that for some, the only way to access a car was through the car club. There is some discussion in the results of the extent to which car ownership might not have been an option for car club members. The car club template notes that the estimated savings in CO_2 are probably greater than estimated because of national data indicating that car club members are often giving up older, more polluting cars.

The measure used a survey of usage by car club members and national research on car club carbon savings (funded by DEFRA) to make the assessment. However, the measure template received did not include an aggregate estimate of the CO_2 savings attributed to measure 9.2.

Goods Delivery to Park & Ride (measure 10.6) enabled customers to leave their cars at Park & Ride sites rather than bringing them into the city centre when they were shopping. Indicators focused on awareness and use of the service rather than attempting to measure the impact on emissions of reduced journeys. Although a greatly expanded take-up may result in reduced car use, the scale of the measure was so small as to have had a negligible impact on CO_2 emissions.

Measure 11.4 (Car Sharing) includes an indicator of miles saved and therefore fuel and carbon saved based on the sum of journeys not carried out as single occupancy trips. Results estimate that the measure resulted in 1,395,165 fewer miles being driven and a saving of 371 tonnes of CO_2 over two years and eight months. As with other SMILE measures, it was noted that this achievement should play a part in delivery of UK National Indicators 186 and 188.

Measure 11.5 Individual Travel Advice contained no explicit indicators of fuel use or reduction in CO_2 emissions. However, it sought to provide alternatives to single occupancy or other car use. It was operated alongside an existing University of East Anglia travel plan which had limited the growth in car journeys at a time when the university had expanded. The measure sought to assess modal split of staff and students. There was some success in this respect with a reduction in single occupancy car use and increased cycling and car sharing. However, no estimate for fuel or CO_2 emissions savings was made.

Behavioural Change Measures

As with other measure groups, modal shift from cars to more sustainable transport modes would be expected to result in reduced CO_2 emissions. However, no direct indicators of savings in CO_2 were collected because of difficulties in isolating the modal split that is directly attributable to these measures within the broader picture of transport interventions in the city.

4.2.3 Environmental Effects: Emissions Affecting Local Air Quality

It is clear from the previous section that there is a close relationship between energy use and GHG emissions such as CO_2. This section considers other emissions and pollutants such as NOx and particulate matter. Only the freight and clean fuel measure groups contain objectives or indicators related to these emissions although others, such as 10.6 Goods Delivery to Park & Ride Sites, made passing reference to the potential benefits in terms of “air quality”. Measure 11.3, Travel Planning, notes that reduced car travel will reduce environmental pollution. An important conclusion drawn from the analysis of emissions in the evaluation of measure 5.4 was that there may sometimes, but not always, be a trade off between fuel economy and its impact on the climate and minimising other emissions.

Freight Measures

In combination, the freight stakeholder club, consolidation centre and priority access routes sought to reduce emissions of NOx, particulates and carbon monoxide. This would be achieved by reducing the number of heavy vehicles travelling into the centre of Norwich. As mentioned previously, the consolidation centre is located around 20 miles from Norwich on the A11 (the main route from the south west) and consolidation centre vehicles would travel to the city centre using bus lanes along this route.

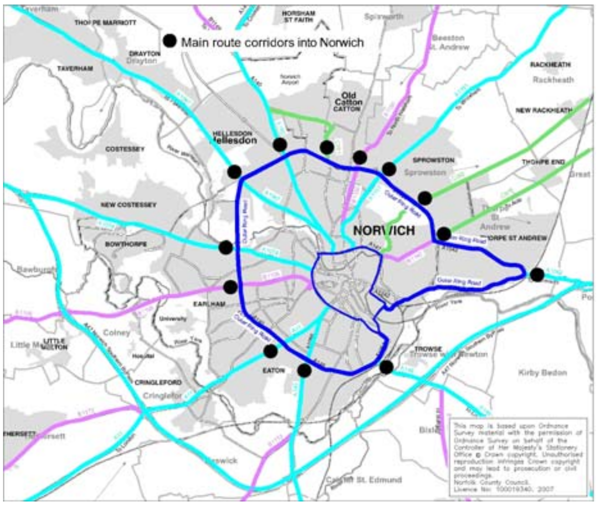


Figure 4.2.3: Access Corridors into Norwich

The map in figure 4.2.3 shows the access corridor from the south west and it is along this route that the benefits from reduced emissions would be most strongly felt. Derived measures of emissions based on the length of journey time spent in congested and free moving traffic and linked to the type of vehicles in use gives a fairly robust assessment of the measure impacts.

As discussed previously, the impact on numbers of vehicles and therefore the impact of the measure has been small so far. Over the implementation period it was estimated that there would have been small falls in the levels of NOx and particulate emissions and a small rise in CO emissions. Projected increased usage of the consolidation centre would lead to greater reductions in emissions including a reversal of the slight negative impact in relation to CO.

Measure 12.8 Customised Transport Information for Freight Operators included NOx as a derived indicator in its evaluation. As mentioned previously, this was run as a limited pilot and its impacts would have been slight. It was noted that the evaluation highlighted the difficulty in assessing the impact on emissions since it was difficult to know what the impact of an adverse traffic event would have been and also because of operator reluctance to give away what they considered to be potentially commercially sensitive information.

Clean Fuel Measures

Measure 5.4 (Alternative Fuel Trials) tested the impact of different bio-fuel blends on polluting emissions. NOx and small particulate emissions per vehicle km were amongst the indicators used in this measure. Measure 5.4 gave an opportunity to test the impact on NOx emissions of different fuel mixes in a real situation rather than in laboratory tests. Equipment carried in vehicles allowed measurement of NOx, smoke and other emissions and a rigorous scientific approach allowed accurate measurement and testing of results.

Using a route which simulates the LEZ (measure 6.2) closely, 5.4 results showed that small reductions in NO occurred at B20 mix, but at B50 there was a small increase. Data from this measure and from the literature suggested that a B20 mix was viable, i.e. that there was no effective unwanted change in

NO emissions, up to B20. The evaluation team did, however, add the caveat that there was no confirmation of whether these results would apply to other vehicles or engines. No results on smoke emissions were available but, based on the literature, no negative impacts were expected to be found in relation to a B20 mix.

High levels of Nitrogen Dioxide (NO_2) in parts of Norwich city centre had led to the declaration of an Air Quality Management Area (AQMA). PM_{10} pollution and black smoke were also perceived as problems which had a negative effect on the perception of public transport. Measure 6.2 involved the introduction of a Low Emission Zone (LEZ) in the affected area.

The map in figure 4.2.4 shows the extent of the proposed Air Quality Management Area (AQMA) and the LEZ. The LEZ covers Castle Meadow which is a main terminus for buses in the city centre.

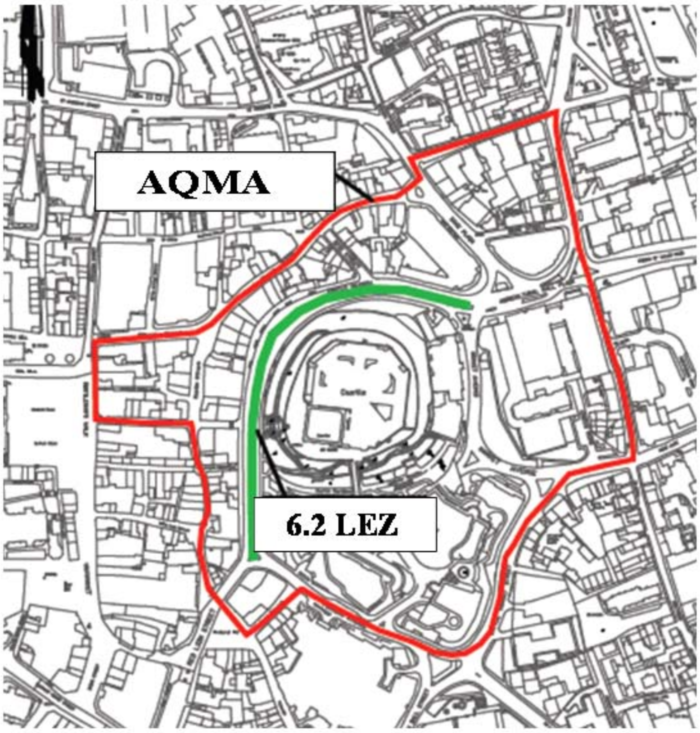


Figure 4.2.4: Air Quality Management Area (AQMA) and Low Emission Zone

A variety of monitoring devices including multiple nitrogen dioxide diffusion tubes and portable monitors were used to collect data on a variety of pollutants. Indicators included NOx, particulate and small particulate concentrations. The baseline conditions were taken from results of monitoring activity up to July 2007 and show NO_2 levels increasing. The measure template provides a detailed account of analysis of a variety of pollutants using the range of data sources available. This highlights that a number of variables including background pollution with concentrations within the city centre, influenced by traffic flows amongst other factors, impact on pollution within the LEZ. In addition, factors such as wind speed have an impact on measurements within the LEZ (increasing wind speed resulting in reduced levels).

The measure reports positive impacts of the LEZ including that engine switch off is associated with reduced NOx emissions, contrary to concerns that it might have an adverse effect. Particulate (PM_{10} and $PM_{2.5}$) levels are close to the Norwich urban mean and heavily influenced by background levels and the evaluation notes a downward trend in the LEZ. Overall, the evaluation concluded that the LEZ had had a beneficial effect in reducing pollution.

Given that a variety of issues influence pollution in the LEZ, it is clear that wider trends will impact on the success of the measure. Importantly, it is noted that bus fleets are the main influence on the level of pollution in Castle Meadow. Modelling shows that increase in bus usage and numbers of buses will lead to increased pollution from this source. However, increased bus patronage is a key objective of measures such as 8.4 and 8.5 and the overall effect of these measures would be to reduce car use which would more than balance any negative effects. Improvements in the quality of buses through time to Euro IV standard will have a positive impact on the levels, but the evaluation concludes that fleet improvements will not occur quickly enough on their own to bring NO_2 levels in the LEZ within government guidelines. Additional retro-fitting of buses and development and availability of clean fuels (i.e. beyond the scope of the SMILE programme) may also be useful measures which would assist in meeting targets. The extension of eco-driver training and of engine switch off TROs and possibly extension of the LEZ are also considered as potentially useful

4.2.4 Environmental Effects: Quality of Life

The mediaeval core of Norwich is an important asset for the city. Increasing traffic levels damage the attractiveness of this area and make it a less pleasant place to visit. Norwich and Norfolk policies recognise this and the SMILE measures help by reducing traffic in this area. The mechanisms by which this works include reducing congestion, reducing noise and diverting large and polluting vehicles from the centre. Previous sections discussed the impact of the measures on pollution, this section goes on to consider how the measures have addressed the issues of noise and congestion.

Noise Pollution

Reduced traffic should inevitably be accompanied by reductions in noise levels; some measures explicitly seek to reduce noise levels. The consolidation centre, 10.5, aims to reduce the number and size of vehicles travelling into the centre of Norwich and therefore the amount of noise created. This effect would be achieved in combination with the other freight measures, 10.3 and 10.4.

Measure 6.2, the LEZ noted that noise reduction would be a benefit of eco-driving, although there was no specific measurement of this effect.

Measure 6.3 aimed to remove traffic from some city streets at times when they would be most used by pedestrians. A major positive effect would be to reduce noise pollution at these times. While the implementation of the measure proved problematic, i.e. periodic pedestrianisation was not possible, there was a calculated effect on noise pollution derived from traffic flow data. The measure results show reductions for the implementations in both St George's Street and St Benedict's Street when traffic flows were reduced, although the impact of the paving material also came into effect in St Benedict's Street, where repaving with block paving negated the reduction in traffic brought about by the initial access only restriction.

Congestion

SMILE documents highlight the importance placed by government on reducing car journeys and particularly single occupancy journeys. The UK Traffic Management Act (2004) also requires local authorities to address congestion. Nearly all of the SMILE measures suggest that they will have an impact on congestion. Each of the freight measures, 10.3, 10.4 and 10.5, states that reducing congestion is an objective. 10.3 additionally sought to impact on congestion by "optimising the payload of those freight vehicles moving within the city". The limited number of vehicles involved in the measures has meant that there has, as yet, been no significant impact on congestion.

Customised Traffic and Travel Information for Freight (12.8) involved a pilot project which made traffic information such as road works, road closures and traffic signal failures available through a customised viewer to participating companies. This would reduce the impact of congestion on goods vehicles by allowing them to avoid traffic congestion, with benefits for the environment and economic advantages for the company. Further developments of the technology might allow direct information on levels of congestion in the city centre to be included. The potential for information systems developed through measure 12.9 Providing Real Time Passenger Transport Information to be linked with this system, creating a situation where public transport could also avoid congested areas is mentioned in 6.2 measure evaluation results. On-street ticket vending (8.5) could reduce the time buses were stopped to allow passengers to board and further reduce congestion. In general it was also hoped that this measure, amongst others, would increase the attractiveness of public transport and therefore reduce the number of cars in the city centre, easing congestion. However, there was no evidence that reduced bus waiting time had been achieved.

Measure 8.4 (Rail Station Interchange) had planned to allow buses to stop within the station forecourt, again, potentially easing congestion in the streets. Unfortunately, this was not possible because it would have resulted in loss of revenue from displaced long stay car parking. Lack of data on modal split hinders evaluation of whether the measure was successful in helping people to choose public transport as an option, although surveys indicated high levels of awareness of accessibility of more buses to the commercial area of the city.

Reducing congestion was also an objective of measure 10.6 Goods Delivery to Park & Ride sites. This would be achieved by increasing the numbers using the Park & Ride facilities rather than travelling by car to the city centre. However, the small numbers of users of the pilot schemes made it "difficult if not impossible" to measure the impact on congestion. The potential attraction of the sites and therefore their potential impact on congestion is demonstrated by the fact that customers are travelling from within a 60 mile radius to the nearest site, indicating the extent to which it can be seen as preferable to driving into the city. Success in showing that the scheme can be run reliably and securely gives hope that there is scope for upscaling and therefore increasing impact but the latest survey results on awareness and acceptance were not available for inclusion in the Results Report.

One objective of Travel Plans (11.3) was to reduce congestion around schools and businesses during the morning and afternoon peak periods. Whilst most of these would be outside the city centre, several private schools are located in the city centre and the impact would, in any case, be positive in terms of quality of these business and school environments. There would also be a positive economic impact on the businesses through reduced waiting time and possibly in the longer term, space given over to parking. Ownership of the Travel Plan is very important for its success and both congestion and parking issues were key concerns of businesses. The impact of the "school run" is cited as a contributor to wider traffic congestion and congestion around schools, with attendant safety concerns was also important for School Travel Plans.

Measure 11.3 assessed its impact on congestion by comparing modal split before and after implementation. This showed a significant modal shift with a 10.3% reduction in single occupancy car journeys to school. Modal shift for major employers ranged from 2% to 45% with an average of 22%. The highest shift was at UEA which was also subject to two further SMILE measures and which had a travel plan in place even before SMILE.

Measure 11.5 Individual Travel Advice was implemented by UEA. Amongst its various objectives, it sought to market sustainable forms of transport to reduce car journeys, including single occupancy, which would reduce congestion. Over the period 2005 to 2008, there was a 1% reduction in car use. Cycling was promoted as part of the measure and there was a large increase in cycling. Physical improvements to facilities for cyclists were undertaken at the same time. There was also a rise in car sharers, whereas walking declined by 11%, with the fall amongst students but not staff.

Reducing congestion, through reducing the number of single occupancy journeys was an objective of measure 11.4, Car Sharing. As discussed above, car sharing was one of the activities which had impacted positively at the university. The approach taken to assessing the impact on congestion in 11.4 was to consider the number of car share members at each workplace scheme and in the public group. 76% of car share users had previously commuted in single occupancy cars and the measure results suggest that this represents a reduction in 1646 cars on the roads at peak times.

Measure 6.3 (Time controlled Access Restrictions) was an innovative approach to controlling traffic in the city centre. By allowing traffic access to the affected streets outside key times, it was hoped that this would minimise congestion in surrounding streets caused by displaced traffic. However, direct measurement of this impact was not attempted.

4.2.5 Social And Behavioural Effects: Institutional Change

Amongst the most potentially significant impacts of SMILE in Norwich and other cities has been the institutional learning which it has brought about. This section looks at the changes in working which have been initiated by SMILE. These relate to public and private organisations and are about change within organisations and the development of relationships between organisations.

The behavioural change group of measures have been most influential in bringing about institutional change. However, other measures have been important in testing out and developing relationships between institutions. In the freight cluster, the difficulties in getting commercial companies to work together became evident in implementing measure 10.3 the Freight Stakeholders Club. Instead of holding regular meetings, it was possible to organise the freight stakeholders as a group for consultation on specific issues.

The establishment of a freight consolidation centre (10.5) required selection of an operating firm with appropriate logistics capacity and this was achieved through a normal tendering procedure. A decision had to be made between competing companies and on balance the council chose the one which could run the logistics aspect of the work more efficiently in the long term over the one which had greater relevant experience and could possibly have delivered more retailer involvement in the short term.

Retailer buy-in to the idea is crucial for the longer term success of the consolidation centre. However, getting retailers to use the consolidation centre also proved difficult, with only two retailers using the centre for delivery to three stores. Part of the explanation for lack of take up is that retailers are said to be unwilling to change existing delivery contracts. Retailers have well-established systems for delivery and need a reason to change. The measure leader commented that “We have to persuade retailers to change everything they know.” Operators of the consolidation centre have predicted increases in its use although there is no evidence presented to support this contention without a significant change in approach.

An interesting further constraint is the lack of difficulty in delivering in the city centre at present: “The question is whether things are bad enough in Norwich to get retailers to change to the transhipment centre. It’s different in Bristol [where there is an analogous scheme] where there are loads of access restriction and waiting restrictions.” It is therefore suggested that increasing delivery restrictions in the city centre would be the greatest driver of increased take up of the consolidation centre. Thus, changing business behaviour is thought to lie in a combination of providing a facility and removing opportunities to carry on with old practices which have damaging environmental and quality of life consequences. However, the origin of the measure in Bristol was also different, because the initiative was introduced in partnership with the major shopping centre which had recognised that its loading facilities were outdated and impacting upon the trading capacity of its stores; in other words, the retailers could see clearly that they had something to gain.

Measure 10.6 Goods delivery to Park & Ride also involved working with a variety of retailers. Here, an issue for retailers was that processes and facilities would be necessary for bringing the goods together and uplifting them from a collection point. This has been overcome at shopping centres where there is already service access and where empty store units can be used. Insurance cover from the council's policy where council vans are being used overcame potential concerns over insurance liability of participating retailers. Provision of a high quality service by the council was also key to establishing relationships with retailers and customers with security and punctuality being the foremost concerns. Retailers are then generally supportive of the idea if they think it will increase footfall and turnover. Increasing awareness of the scheme amongst the public is important for expansion, as is developing the service to meet the needs of the public, e.g. through a 'Sunday Shop & Go'. Word of mouth is seen as an important marketing tool since there are many repeat users of the scheme. "The heart of it is making it simple and easy to use." (Measure Leader)

Over the period the scheme has been in operation, the council has built up expertise and a model which works. The council is therefore in a better position to promote the scheme in future. The measure leader also sees the advantages of the scheme developing further as part of "city centre management" with a dedicated van rather than stores using their own [14]. The scheme could be expanded to other Park& Ride sites and the option of delivery to these sites rather than home delivery could be advertised in store publicity material.

The economic constraints on adopting sustainable transport initiatives which involve investment by private companies in plant and vehicles was demonstrated by a number of measures including 10.5 the consolidation centre and measure 12.8 where access to commercially useful traffic information was insufficient incentive to convince companies to retrofit vehicles to be more environmentally sustainable. A key message of these measures is that commitment to sustainability is not in itself sufficient as a driver to overcome commercial considerations.

11.3 Travel Planning is a core "soft measure", which has brought about significant behavioural change (as mentioned elsewhere, it links well to other measures such as car sharing, the city centre car club and individual travel advice) and can be seen as a major success. Within the County Council it has been the focus around which a team of travel plan professionals has been built. This is claimed to have transformed the department from one which was predominantly focused on hard, engineering and infrastructure approaches to one where behaviour change was recognised as a key concern.

The influence of the Travel Planning measure was predicated on its success where physical measures had been relatively unsuccessful. In part this was a result of strong leadership and engagement by the measure leader: the measure created 88 school travel plans compared with a target of 30 and also worked with 20 businesses to create travel plans. Moreover, the Travel Planning approach was seen to have more significant effects than physical improvements or, indeed, regulatory measures on their own. Improving safety on specific routes to school under the pre-existing Safer Journeys Initiative was laudable but only directed efforts to a small number of schools and did not address wider sustainability concerns. Linking these to travel planning meant that pupils, teachers and parents were engaged and greater health and environmental benefits were evident at a much larger number of schools. This required change within the other organisations with children actively involved in walking and cycling schemes and parents engaging with sustainable transport e.g. in using Park & Ride facilities.

The momentum developed under the measure encouraged the city's independent schools to identify an opportunity to exploit Park & Ride for sustainable travel. A campaign involving a newly formed City School Cluster Group targeted families who travelled from the outlying villages into the city centre each day and offered discounted rates for pupils to use the established Park and Ride network. Parents were encouraged to accompany their young children through a cheap 1p 'chaperone ticket' which made this mode of transport an attractive option. This innovation has since been extended to include other city schools with wide catchments.

[14] The scheme has operated with some council operated and some shop operated vans.

Travel Plans work where the organisation developing the travel plan engages with it and takes ownership of the idea. Work done under measure 11.3 contrasted sharply with previous practice where businesses hired outside consultants to produce travel plans to meet development planning conditions. These travel plans were subsequently not used or monitored by staff.

Institutional change and learning is an integral part of Travel Plans developed under the SMILE initiative. This has been demonstrated in both schools and businesses and the skilled approach taken by the council staff has been a catalyst for this change. The initial contact is important and a survey for all people at the site helps to start off interest. The survey gives a baseline picture of travel patterns but council staff members also encourage people at the site to use it to identify themes, such as safety, health, and pollution, which are important to them. A mix of online and paper surveys is used depending on which mode individuals are most comfortable with. At every site there is also an opportunity for people to add their own questions to reflect issues which are important to that site. Travel Plan staff have found that businesses with a good Human Resources department tend to take up the travel plans more actively.

Organisational change needs to be nurtured to maintain it in the long term and after the survey, a five year Action Plan is developed and monitored. After the first year the site is resurveyed and the plan is renewed. SMILE has provided finance to carry out this work and make it a priority but it is thought to have succeeded when it is taken up by champions within the site. An ongoing issue for the council is that these champions may move on and support needs to be available to reinvigorate the travel plan when necessary.

Promotional activities have been important for the Travel Planning measure. Links have been built up with local media, on television and the press which have helped generate interest. National radio has also been supportive. Events have also been used to promote aspects of the Plan and links have been created with ‘Theatre in Education’ groups and ‘Cycle Promotion Teams’. Companies have been encouraged to develop awards schemes within the Travel Planning package and a generally professional approach to promotion has been developed. This is evident in the range of schemes operated such as the ‘Steppers’ walking initiative for schools. Overall, Travel Planning has allowed the Council to develop marketing and promotional skills which have been used to generate enthusiasm and awareness about sustainable transport. This in itself represents progress as an institution and it also helps other initiatives within SMILE, many of which saw raising awareness and acceptance as indicators of success.

Change within Norfolk County Council and Norwich City Council

The SMILE programme is based in Norwich but involves a joint approach by Norwich City and Norfolk County councils. The majority of the measures are led by the County and the Site Manager is a Norfolk County Council officer while the Evaluation Manager works for Norwich City. Although work in developing the SMILE bid was shared about equally by the authorities, implementation has involved the County to a much greater extent.

Within the authorities, thinking on transport was characterised by interviewees as having been very much related to physical infrastructure before SMILE but SMILE changed this. For example, the Public Transport Integration measures go beyond previous thinking on public transport which focused on traditional, hard measures such as putting in bus lanes. While some of the SMILE measures, for example, 8.5 On-Street Vending Machines, involve physical change, their value is in “Changing hearts and minds” about using public transport. The councils also recognise that there is merit in changing “warm words” about cleaner freight into something more tangible by reorganization of the way freight works. In these ways, against some resistance, SMILE changed the mindset within the authorities to be more accepting of “soft” measures.

The relatively small impact of many of the measures during the SMILE period was an obstacle to this change in institutional culture. The previously mentioned freight measures have set in place structures which may be upscaled to produce environmental benefits but impacts to date have been insignificant.

The Goods Delivery to Park & Ride scheme (measure 10.6) raised some officer concern about how time consuming the measure was for relatively small benefit, especially since there were peaks and troughs in its operation throughout the year. However, it was accepted that a lot of effort is needed to market and expand the service which is regarded as innovative. The measure is very much at the fore of what has been achieved in the UK, with other cities interested in copying it and its attraction includes its usefulness in branding Norwich and Norfolk as innovators in sustainable transport.

The relatively low level of modal shift at the County Council compared with other employers with Travel Plans was indicative of the lack of crucial managerial support at the outset. Service managers were not allowing staff sufficient time to engage with sustainable transport issue when they had other priorities. However, the mutual support that SMILE measure leaders were able to give each other over the SMILE period increased their confidence and the profile of sustainable transport, particularly of soft measures. One measure leader stated that:

"The support of the colleagues in the CIVITAS family has been immensely important and it has given support to the whole initiative really, and added value because we are a small voice in the midst of road builders and we are trying to get people on bikes and car sharing and walking and it has always been "car oriented". So having a group of nine initiatives to support you, you are not on your own struggling."

SMILE measure leaders described their role as proactive in changing opinions within the department. This included holding lunchtime seminars and inviting colleagues from throughout the department. In the early days it was "incredibly difficult" to get transport engineers to engage with soft measures such as travel planning. Staff also did a lot of work in speaking to elected members to get them on board with the idea. Now soft measures are "established and not just an add-on" with other staff involved in working groups and also coming to travel planning professionals for advice.

After travel plan staff have gone to the schools and businesses and discussed ideas with people it creates an expectation that they are in post and will help. Originally there was only one person in the travel plan team but now there are six. Spreading enthusiasm for sustainable transport is seen as an important consideration in staff recruitment and the success of the team is based on staff being perceived as "keen and motivated". As stated in interview:

"Once travel planning has been established it creates a high demand for ongoing support…and of course you can't then walk away from it, people want to come and have regular meetings with you and realising there are a lot of schools and businesses in the CIVITAS area. That poses a problem itself because you are engaging with everybody and we have to sort of keep up the momentum."

The Travel Plan measure leader also noticed that there was an increase in cycling within the council with more people cycling and their interests changing through time from concern over safety, through an increase in awareness of the health benefits, to an interest in both health and the positive effect on CO_2 emissions. This was a measure of changed culture within the organisation and the large number of sustainable transport initiatives brought in by SMILE was believed to have been influential in bringing about this change. There was evidence that this "critical mass" of initiatives had influenced departments more widely:

"It has been hugely significant for colleagues in Development Control and you hear them in the office talking about cycling routes and things like that and they are not just focusing on cars, thinking that roads are for cars but are shared use and if we are serious about getting people out of cars they have to feel secure in the other modes."

It is notable that similar views were expressed in Malmo where soft measures were given more prominence and were beginning to influence overall policy development (see separate Malmo report). The relatively few measures led by Norfolk City Council was an obstacle to team working across measures. Nevertheless, links were still made between the measure leader of, for example, the Car Club, and leaders elsewhere dealing with Individual Travel Advice and Travel Planning. Given the complementary roles of different tiers of local government in some places in the UK, ensuring that there is team working across tiers of local government should be seen as a priority. This would tie in well with the joint approach taken to transport between the Norfolk and Norwich.

Transnational opportunities can also be seen to have been partially fulfilled within SMILE. For example, Tallinn only had two measures within SMILE but a large number of transport initiatives were subsequently developed (again see separate Tallinn report) demonstrating that the existence of a larger SMILE "family" can be energising for local policy. However, it was noted by many measure leaders in Norwich/Norfolk and other cities that even more opportunities for sharing ideas and experiences across similar themes in different cities would have been beneficial.

Influencing the Policy Agenda

The institutional changes brought about by SMILE in Norfolk and Norwich are possible partly because they fit with the wider policy agenda both nationally and locally. The site manager noted that NATS policies had been under development from 1997 through to 2006. When SMILE involvement was under consideration, council staff looked at how SMILE objectives could dovetail with council objectives and found a good fit between the two. CIVITAS has to some extent become a delivery mechanism for objectives in NATS, but is not explicitly part of NATS.

Travel Planning is an overarching measure which touches on the other soft measures. As discussed later, this measure also links well with those which aim to improve the attractiveness of public transport. This is because travel planning is fundamentally about changing the modal split and opportunities to use modes other than private cars facilitate this shift. When travel planning staff visit work places or schools to talk about bus use and trying to promote bus passes, they also take along information about cycling, walking, car sharing and the car club. Travel planning is a prime example of a SMILE measure acting cumulatively with wider policies.

Travel Planning is consistent with a variety of policies developed in Norwich particularly in NATS4. Figure 4.2.5 highlights how Travel Planning is connected to national and local policy:

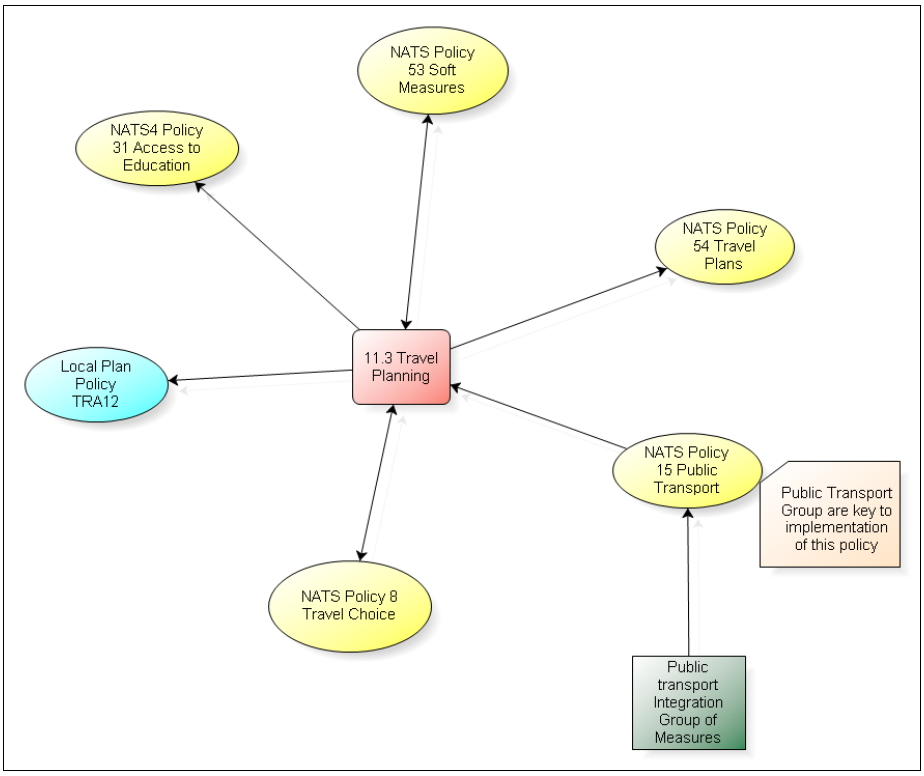


Figure 4.2.5: Interaction between Measure 11.3 and Local Authority Policies

The following table expands on the analysis to highlight cumulative effects relationships between measure 11.3 and local policies shown above.

Table 4.2.2: Policies with which Measure 11.3 Travel Planning Interrelates

Policy	Policy Description	Travel Plan Relation to Policy
NATS4 Policy 31: Access to education and NATS4 Policy 54: Travel plans	The County Council will work with schools and other partners, including other local authorities in the area, to develop school travel plans.	Measure 11.3 is the method of implementing this policy.
Local Plan (Land use planning) Policy TRA12	Requires that Travel Plans are integral parts of many development proposals.	Options for extension of Travel Plans to these areas are being considered.
NATS4 Policy 8: Travel Choice	The Transport Strategy seeks to improve accessibility in the Norwich Area by: Improving facilities for all modes of transport; improving access to support the economic health of the Norwich Area and accommodating growth in the number of trips by means other than the car.	Travel Plans support and empower people to make modal shifts to sustainable forms of transport. The measure provides staff support, marketing and resources to encourage this and ultimately relies on people in schools and businesses taking ownership of the initiative and making it work in the long term.
NATS4 Policy 15:Public Transport	The reliability and overall quality of public transport services and information will be improved.	This policy is important for the success of Travel Planning. Sustainable transport choices are encouraged and can be made more rationally where public transport is more reliable and has good quality information.
NATS4 Policy 53:Soft Measures	Soft transport measures, designed to give better information and opportunities, will be intensively developed.	Travel Planning can be a route for disseminating this information and can work with other measures such as car sharing to help implement policy.

Travel plans have also been feeding into the capital works programme. Access to the Safer & Healthier Journeys to School budget has provided changes to the physical structure outside schools with requests for infrastructure improvements coming directly from school Travel Plans. Traffic calming, dropped kerbs, pedestrian phases on traffic lights, speed reduction zones, parking restrictions, cycle lanes and new footpaths and both pedestrian and cycle (toucan) crossings have all been implemented. This allows a more targeted use of capital resources, directed to needs expressed by users and to where there is long term commitment to sustainable transport.

In interviews with the evaluation team, staff described some other measures as key to delivery of the LTP and NATS, whereas others were in line with the objectives of policy but not so clearly related to implementation. For example, the LEZ (measure 6.2) was essential to meeting a statutory obligation to improve air quality in a particular part of the city by 2010. On the other hand, measure 5.4 trialled biofuels and moved understanding forward in relation to GHG emissions, but was not directly delivering on commitments in the LTP or NATS.

Overall, there is now a more sophisticated understanding of the relationship between soft and hard measures. There is a danger that economic considerations could make soft measures an attractive alternative to capital spending. However, 'hard' measures such as developing the Rail Station Interchange are an essential component of a transport strategy. What SMILE has been able to demonstrate is that it is the 'soft' impact of hard measures such as this in changing attitudes and behaviours that is important. The SMILE measures have demonstrated the importance of engaging with individuals and other organisations to influence long term behaviour.

The particular success of Travel Planning has been a beacon of how this has worked and specific activities including opportunities for eco-driver training have been taken up over a number of measures. Both the city and the county are said to be: “looking with travel planning eyes; to see if cyclists are being blocked or pedestrians are being pushed away.”

4.2.6 Social And Behavioural Effects: Modal Shift

Modal shift is an indicator for a large number of measures as shown in figure 4.2.6.

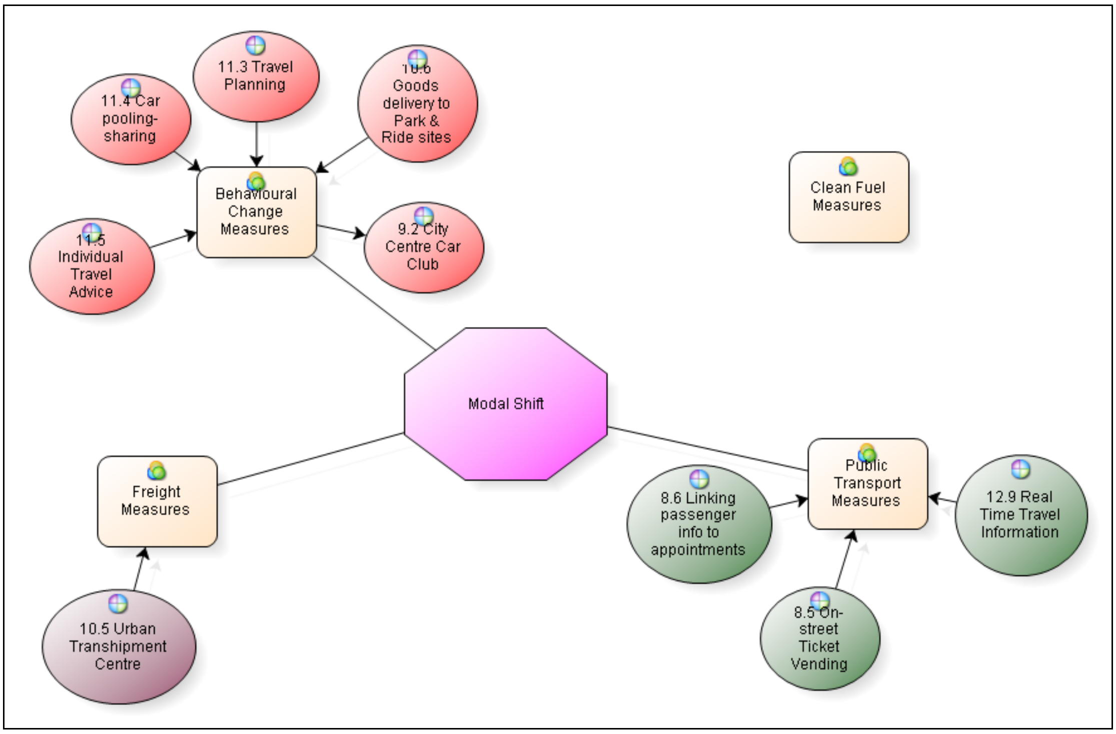


Figure 4.2.6: Measures Impacting on Modal Shift

Reference to modal shift is made in five of the Behavioural Change Measures (9.2, 10.6, 11.3, 11.4 and 11.5). Within the Clean Fuel measure group it is only mentioned in 6.2 LEZ (and here only in reference to another measure to which there are some links). It occurs in 10.5 Urban Transhipment Centre as the choice of location for the centre included proximity to rail links. It is referred to in all four Public Transport measures.

Modal shift is not specified as an indicator in car club measure (9.2) but data is collected which shows a 12% increase in cycling and 9% increase in walking amongst car club members. Travel Planning (11.3) highlighted significant modal shift at all of the establishments which instituted travel plans as shown below:

- The modal shift shown in schools was 10.3%
- Estimated 4392 fewer pupils being driven into school each day

The situation at businesses varied with:

- Norwich Union 35% modal shift
- Norfolk County Council 2% modal shift
- UEA 45% modal shift
- City College 6% modal shift
- Overall, combining the 4 workplaces 22% modal shift

On the other hand, specific data on modal shift to walking and cycling is only partially available (e.g. it can be seen for the workplaces but not the schools).

Measure 8.4 (Rail Interchange) set modal shift as a key indicator. It was to be a derived figure relating to passenger km per mode. However, the results report states that no data was collected on modal shift. Further contact with measure leaders in 2009 confirmed that no data collection had been put in place for modal split across a range of measures. This is a significant limitation to the evaluation of these measures and points to the need for a city wide approach which is flexible enough to provide meaningful results for individual measures.

Modal shift is highlighted as a policy area in a variety of local authority policies and so SMILE measures can be seen to be methods of implementing these policies and achieving tangible impacts.

Table 4.2.3: Local Authority Policies and Modal Shift

Policy	Treatment of Modal Shift
RSS (2004)	Seeks to achieve close co-ordination between new development and transport infrastructure, improved demand management and transportation modal shift.
Norwich County Council Structure Plan Policies TRA3, TRA10 and TRA11	Bringing about modal change at new developments.
Norwich County Council Local Plan	Compact city gives opportunities for modal shift. Development must make space available for Car Clubs. Development must consider improved access and interchange between modes of transport. SPD developed to highlight transport contributions from developers.
Norfolk County Council Local Transport Plan	Includes multi-modal studies of major transport schemes.
Norwich Area Transportation Strategy (NATS) 2006.	States increased demand for transport should be met by means other than the car. Developers should contribute to sustainable transport choices at development sites. Revising Mode hierarchy. Explicit links to RSS e.g. improving interchange in the city between different modes.
Other Relevant NCC Policy Areas include:	Encouraging modes other than car to get to city centre including Park & Ride.

4.2.7 Social And Behavioural Effects: Eco-driving

Eco-driving provides an interesting contrast with modal shift, in that it brings about reduced fuel use and emissions without changing modal choice behaviour. With the exception of measure 6.2 where eco-driving was a ‘supplementary measure’, there were no separate measures where eco-driving was an explicit objective. However, eco-driving emerged as a successful component of implementation across behaviour change, clean fuel, public transport and freight measures.

It became clear during implementation of several freight measures that original expectations that companies could be persuaded to invest in fleet improvement to reduce emissions were unrealistic. Undertaking eco-driving training was therefore used as a qualification for involvement in pilots or otherwise offered as an incentive to companies. Eco-driving training is already a requirement for freight operators receiving additional traffic information through measure 12.8. The original plan for the measure had been to require participating freight operators to retro-fit pollution reducing equipment but this had proved too costly. In contrast, eco-driving was seen as positive by companies as it had economic benefits in reducing their fuel costs.

Measures designed to improve air quality also included eco-driving. Results in terms of energy efficiency improvements and emissions reductions appear impressive with these sometimes outweighing the other aspects of the measures. For commercial companies, eco-driving gives impressive savings without major capital investment. Awareness raising for participants in courses may also have wider behaviour change benefits in time.

Within the Travel Planning measure, eco-driving was one of options presented to workplaces as something they could consider in developing their travel plans. In line with the general travel planning philosophy, this put the onus on companies to take ownership of the idea and make it successful if it was one of their priorities. Unfortunately, there is currently no information presented on the extent to which this was taken up.

Eco-driver training was not included as part of the implementation of car sharing, measure 11.4, but in publicity material it did aligned itself with cleaner driving, for example by advertising in a publication which included articles on eco-driving and clean vehicles. The measure results report recommends that eco-driver training opportunities should be made available as part of future development in order to reduce pollution levels further. This approach would also be appropriate for other membership related measures such as 9.2 City Centre Car Club.

While measure 5.4 concentrates on the trial of different fuel mixes, results are influenced by issues such as ‘driving style’. Measure 6.2 LEZ also sought to impact on pollution levels and emissions. Eco-driver training was offered to all participating organisations and take-up was good with 90 drivers receiving free training. This is consistent with the view that eco-driving is a ‘win-win’ for the environment and organisations and the narrative in the report on measure 6.2 also highlights that there are additional benefits for the companies in reduced maintenance costs. Fuel economy was an indictor of the measure impact and as mentioned earlier, eco-driver training had a potentially greater impact on fuel economy (19%) than the Engine Switch-Off TRO and limiting access to cleaner vehicles (around 3%).

Eco-driving has a large impact on fuel economy and emissions and also reduces noise pollution. It is cheap to administer (delivered in 2 hour or half day courses under measure 6.2) and results in cost savings for organisations. It can potentially build on the awareness of private individuals who make positive choices in car sharing and car club membership. Eco-driving is said to require some refresher training to maintain high standards (Measure 6.2 results report), but is clearly one of the most cost effective ways to make a direct impact on reducing environmental damage and involves personal commitment which could lead to wider behavioural change.

4.2.8 Social And Behavioural Effects: Health

Encouraging people to use modes of transport other than car can lead to additional health benefits. On a city and local scale, the reduction of pollution can lead to health benefits through reduced respiratory disease and other ill-health associated specifically with pollutants.

Whilst increases in public transport can reduce pollution through fewer vehicles and less road congestion, the effect is not always entirely positive. The LEZ high emission levels were associated with high concentrations of buses and the measure results point to the possible negative impact of increased bus patronage. However, at an overall city level the increase in bus use will have a positive effect and specific area related problems should not divert attention from implementing measures which make public transport more attractive. Measures such as 6.3 Low Emissions Zone can mitigate the problems caused through traffic orders and through driver training. In the longer term, measure 5.4 increases knowledge of the mix of fuels which best meets the objectives of minimising pollutants and saving energy.

Freight measures have the potential to decrease pollution in the city centre by reducing the number and size of freight vehicles entering the city centre (measures 10.3, 10.4 and 10.5). Measure 10.4, Priority Access for Clean vehicles does not currently have an impact on reducing congestion for clean vehicles but is consistent with the LTP strategic theme of reducing congestion. Measure 12.8 has piloted technologies and systems which can be further developed to increase traffic information which could help freight vehicles avoid congestion and therefore reduce emissions and have a positive impact on health.

Several of the measures encourage walking and cycling which have direct health benefits for the participants. These are discussed in the following sections.

4.2.9 Social And Behavioural Effects: Cycling

Cycling was an important aspect of NATS policy but, with a few exceptions, cycling has not been a major focus of the SMILE programme in Norwich. Council staff members suggest that this was probably because none of the policies relating to cycling were particularly innovative at the time the SMILE proposal was being worked up. The cycling officer post within the county was not filled at that time and it is thought that this may have been a factor; this emphasises the importance of having champions in place to drive innovation forward within an organisation[15].

Cycling groups have lobbied the council in relation to several of the measures. Constructive engagement with cycle groups led to changes in the detail of measure 8.4. resulting in enhanced cycle parking facilities being included in the final design of the rail station interchange. This flexibility brought benefits for the measure in securing support from cycle groups and contrasts with the freight measures where cyclist opposition remains strong.

Relations with the cycle lobby have been problematic with regard to the freight measure 10.4 (Priority Access for Freight), which utilized bus lanes for access to the city centre. Cyclist groups were included in consultations over the measure and have been unhappy that they have had to share lanes with freight. It is acknowledged that the bus lanes are too narrow to allow cyclists to be overtaken without moving into the main flow of traffic. The concerns tie in with the LTP strategic theme of ‘improved road safety’ and there is a need to demonstrate that the SMILE freight measures do not have a negative effect in this respect.

[15] As discussed previously in relation to institutional change, the increasing importance of soft measures in general can be seen as a demonstration of this effect.

Measure 10.4 results report shows no increase in accidents and none involving freight vehicles on the bus lanes used; although the amount of data is fairly limited and no data was available at the time the results template was completed to indicate whether there had been incidents involving cyclists after the implementation of the measure. In recognition of the potential dangers to cyclists, consolidation vehicle drivers were to receive training in awareness of cyclists and have Fresnel lenses fitted to their vehicles to increase visibility of cyclists to them. Nevertheless, it appears that cycle organisations are continuing to oppose the use of bus lanes for this purpose. If the number of freight consolidation centre journeys increases as is hoped, this tension will remain and may increase.

Cycling is encouraged in a number of SMILE measures including 11.3 Travel Planning. Cycling has been promoted in schools and increasingly businesses are requesting help in writing travel plans which include reference to cycling. Businesses see it as very positive if they can get people who live more locally to use bicycles as this is a very easy way to reduce congestion and parking problems. The County Council has had “bike breakfasts” and it has also had a cycle club visit to promote cycling. The cycle club was involved in a “50% cycle club” where people agreeing to cycle 50% of the time are given cycling helmets and lights and lent bikes for a temporary period. At the end of that period they can buy the bike at a discount. This results in positive behaviour change where people have been waiting for a push with one participant saying:

“I’ve been driving to work for 19 years and now I’m cycling. Getting the support made a huge difference.”

Individual Travel Advice, measure 11.5, implemented by UEA is set firmly within the council’s policies of encouraging sustainable modal shift, including a shift to cycling. The ongoing university Travel Plan is also important contextually. The Travel Plan had seen the upgrading of infrastructure for cycling such as cycle parking and shelters.

This measure targeted groups who lived close enough to the university for cycling to be an option. Engagement with the university bicycle user group was good and a number of aspects of the measure, including a “try before you buy scheme” for staff and students, helped make the decision to change transport mode easier: 39 of the 48 people who used the scheme bought the bikes. This scheme is a similar to an approach taken in Travel Planning measure 11.3. Measure 11.5 also included an innovative approach where the university guaranteed to buy back cycles from some students at an agreed price. Maps showing information about cycling, walking and public transport were also produced. Knowledge of cycle routes increased after implementation of the measure. Surveys showed that cycling had increased after implementation of measure 11.5.

The city centre car club, measure 9.2, reduced dependency on car ownership and increased opportunities for people to make informed choices about other modes. Survey results showed that cycling had increased by 12% amongst car club members. A proposed mechanism for this is that it highlights the cost of each journey and people are able to decide that cycling is more cost effective than driving for some journeys and to choose to use the car only where it is necessary or where the convenience is justifiable in cost terms. The impact of car sharing (measure 11.4) is potentially more problematic. Measure leaders think it is possible that some people who would have walked or cycled may now prefer to car share. Although this may not increase the number of cars on the road, it can be seen as a negative in terms of the heath benefits that people are foregoing.

4.2.10 Social And Behavioural Effects: Walking

There is a general presumption amongst the behaviour change measures that they will result in increased levels of walking. This is achieved through awareness raising, through making options other than car travel easier or, in some instances, making the costs of car travel more obvious and therefore encouraging other modes for particular journeys. In some cases, attitudinal change is reinforced by physical improvements to infrastructure to make walking a better option.

Travel Planning (11.3) is concerned with working with people to adopt more sustainable travel. Improving health by encouraging walking (and cycling) was specifically noted as an objective. However, in the context of a single measure it was not appropriate to try to assess the extent of the impact on health, merely to note that walking is healthy and try to gauge the extent to which it had increased during the implementation of the measure. As a behaviour change initiative, travel planning with schools was seen as beneficial in tackling lifestyle issues and encouraging children to walk from an early age, so that it would influence behaviour over the long term.

Measure 11.3 moved on from the Safer Journeys Initiative which had done valuable work in raising issues about safe journeys to school but which was very much the council's initiative, even where schools helped identify where dropped kerbs etc were needed. Measure 11.3 was more about schools taking ownership of the idea and therefore more likely to motivate people to change behaviour and adopt more sustainable travel such as walking. Leaflets and booklets sent to schools were also part of a motivational approach to get people walking. The measure tied in with wider events to help in motivation, for example the National and International Walk to School Week.

Particular initiatives, such as the 'Steppers' scheme, were developed to encourage children to walk to school. Steppers was disseminated regionally as Best Practice and influenced national policy for payment of non-capital grants for walking initiatives. Another scheme 'Park & Stride' encouraged parents to park some distance from schools and walk the remaining 5 to 10 minutes of the way.

In businesses attitudes have changed over the last 10 years in ways which make them more receptive to travel planning ideas. For example, travel plan staff note that people will be less likely to see it as their right to drive and many more people walk unless they are unwell or have a particular need for the car that day.

Measure 9.2, the city centre car club, sought to give people options to use modes other than the car. As with cycling, walking amongst members increased, with a 9% increase in walking recorded by car club members. Car sharing (11.4) may allow some people to choose to share rather than walk. However, given that the journey distance of those who would be able to walk is shorter than for those who can cycle, the impact may be less marked. Measure 11.4 was judged to have achieved its objective of increasing choice and encouraging walking (and cycling) as an option.

Individual, personalised travel advice was provided by measure 11.5. This included information on how far the walk to the campus actually was and focused in part on groups who feel vulnerable to crime (defined to include women) who may be reluctant to walk. Students tended to live nearer to the university and had greater opportunities to walk than staff (who tended to cycle more). As with cycling, the initiative included maps of walking routes to the university.

However, the UEA Individual Travel Information measure was accompanied by a reduction in walking amongst students (although there was no reduction in staff walking and the overall numbers using modes other than single occupancy car journeys increased). It is not discussed in the measure results but given that the fall in walking is accompanied by an increase in cycling, this raises the question of whether the change is positive, reflecting a move from one sustainable mode to another. A specific objective of the measure was to raise awareness of information on sustainable transport modes and this appears to have been particularly successful with regard to walking and cycling.

The Travel Plan measure noted that at the outset 12% of staff across four large workplaces walked to work whereas this had increased to 16.75% by the most recent surveys in 2008. Some methodological issues were noted in relation to surveys conducted of modal split. For example, surveys of walking at different times of the year may have been affected by weather conditions.

Travel planning officers have noted that they are being asked by other County Council staff to become more involved in decisions across a range of areas including new footpaths to encourage and enable walking.

4.2.11 Economic Effects

The wider economy is important for measures in determining whether they can be implemented as intended. It must also be taken into account in assessing whether the impact seen was due to the measure or the wider economy. This can be demonstrated most readily in relation to modal split. As has been seen, a number of measures sought to make public transport more attractive than car driving. Other measures such as car club and car sharing also sought to create viable alternatives to owning and driving a car, particularly for single occupancy journeys. However, implementation of the measures coincided with a period of rapid increase in fuel prices. This will undoubtedly have made car driving a more expensive option and this will have impacted on modal choice. There are no data available from the SMILE evaluations which can be used to assess the impact of this wider economic factor.

Notwithstanding this overarching issue, economic effects were chosen as an indicator of the impact of many measures. However, the type of economic indicator varied greatly and there are difficulties in comparing the economic results across measures. Some of the measures defined and accounted for economy in terms of value for money of the measure for the SMILE programme or the council. This VFM assessment usually included a quantitative measure of cost impact. In other instances the measurement related to the economic benefits for individuals or companies taking part in the measure. These were typically expressed in terms of fuel economy. Sometimes the focus of economic consideration was the cost of taking part in the measure e.g. for companies expected to retro-fit vehicles to make them more environmentally friendly. Given the variety and incompleteness of economic assessment within individual measures, it has not been possible to make an overall quantitative assessment of the cumulative economic impact of the SMILE measures.

Behavioural Change Measures

Measure 11.3 results suggest that the large numbers of schools and businesses involved represents excellent value for money. It is possible to point to the previous expenditure of £200k to £300k per site with relatively little impact on modal shift and note that the sustained modal shift achieved through the Travel Planning measure represents improved value. Most of this has been achieved without significant capital expenditure and any capital expenditure from existing budgets which is used in conjunction with the measure can be seen to be more efficiently directed. The car share measure (11.4) assesses economic results in relation to value for money for participants and this was estimated at £99,369. Although not implemented as planned, the pedestrianisation associated with measure 6.3 is considered to have the potential to improve profitability and rental income in the area.

Clean Fuel Measures

Measure 5.4 (Clean Vehicle Trials) considered cost implications but concluded that there were no specific changes in cost which could be identified when moving to a biodiesel mix. Differences in costs are seen to be related to commercial strategies of individual suppliers and operators rather than inherent differences in fuel cost. These strategies will also be in part based on the impact on warranties for vehicles using different fuels such as those with a mix above B5. As mentioned above, this could be influenced by subsidy regimes if a particular blend was seen to be more beneficial to the environment; ironically, at the time work was conducted the UK subsidy regime favoured a B5 mix, rather than the B20 mix which was shown on balance to be the most beneficial.

LEZ measure 6.2 indicated that there were costs associated with various technologies. One example would be the estimated cost of £10,000 per vehicle for fitting a Selective Catalyst Reduction System to buses together with increased maintenance costs. The measure results also highlight, without quantifying, extra administrative costs for the Council in enforcement of the TRO and TRC in the area.

Freight Measures

The relatively small impact of these measures overall means that no significant economic impacts can yet be seen. Traffic and Travel Information (12.8) was implemented only as a pilot. It is fair to say that implementation should result in reduced fuel use and quicker deliveries through avoidance of congestion but the measure results could not quantify these. The cost of retro-fitting vehicles was seen to be an obstacle to implementation of the measure as originally planned. The cost saving approach of eco-driving was put in its place but no figures were available in the latest version of the results template to quantify the extent of these savings.

Public Transport Integration

It is unfortunate that modal split/shift and bus patronage information which could show the extent of change in use of public transport is not available. There are some data relating to increased use of on-street ticket vending machines. However, it not possible to determine the extent to which this represents new passengers or simply existing passengers purchasing tickets in a new way.

Summary

It is clear that there are economic impacts arising from the SMILE programme. In some cases there are indicators which show specific effects. The results help to provide an understanding of economic issues which relate to implementation, especially where private sector partners are involved. A full understanding of the impact of wider economic issues on measure results requires an approach which is much broader than any individual measure.

4.3 Tallinn

4.3.1 Context

Within SMILE Tallinn has implemented only two measures, both of which are linked and address the declining public transport services available within the city. The worsening quality of public transport has affected virtually everybody in the city, but most of all it is women, children and elderly people who are most dependent on it. The massive shift to private car use has worsened the city environment dramatically. Further the old part of the city has been graded as UNESCO world heritage and it appears urgent to save it from damage caused by traffic. One of the reasons is the congestion in the city centre due to the growing number of cars that have also caused deterioration of the public transport service. Much of the background has been sourced from local material via the Cumulative Effects Analysis and is fully referenced in the Cumulative Effects for Tallinn.

Economic and Spatial Development Background

The development of the transport system in a city is an important feature of economic restructuring in East and Central European countries. This restructuring was related to changes in the sectoral composition of employment, as both agriculture and industry faced employment losses, and new jobs emerged mainly in the service sector; and (2) the increase of unemployment. In Estonia, the losses of agricultural jobs were especially significant because of the very radical political and economic reforms at the beginning of the 1990s.

The population growth rate of the Tallinn metropolis exceeded that of Estonia as a whole, and hence the share of the country's population living in Tallinn metropolitan area increased considerably over time as well. 50% of the people living in the suburbs were employed in agriculture in 1982, less than 10% of these people were engaged in agriculture in 2000. Employment in the service sector underwent an opposite change, and more than half of the employed people living in the suburbs worked in the service sector in 2000.

A radical property reform took place transferring the ownership from public to private agents. The redefinition of property relations has been one of the cornerstones in the transition to the market economy; the Act on Ownership Reform (1991) was among the first to be passed by the re-established Estonian Parliament. Land has been transferred from the state to private ownership through restitution and land sales. In restitution, the property expropriated by the socialist government in 1940 has been returned to the previous owners or their heirs. If new buildings had been built on the lot since the expropriation and someone else had claims to these buildings, properties were not returned but compensation was paid instead.

Approved city plans to change the land use did not prevent restitution. Estonian property restitution has been among the most comprehensive in Central and Eastern Europe. Unless the property right was recognized through restitution, tenants were entitled to the right of first refusal on the property. This has been the major form of privatization in the areas built during the socialist era. Private individuals have paid for the residential land mainly with national privatization vouchers and land auctions have been used to sell non-residential properties to investors.

The overall climate, of moving from public land ownership to private, means that there will be inherent difficulties when the reverse is needed. Public land may be needed for public transport projects and the situation would make its acquisition expensive and unpopular.

The change in employment along with the urbanisation and the privatisation that resulted in growth for Tallinn, gave rise to a new status quo of spatial development and transportation needs. Cars are by far the most important transport mode for commuters today, whereas public transport dominated overwhelmingly during the Soviet era.

There are possibly three main reasons behind the increase in car-based commuting.

- First, suburbanisation brought a much more fragmented settlement pattern than that of the Soviet period. Alongside the relatively compact settlements of the Soviet period, two other types of areas witnessed population growth in the 1990s: (1) summer cottages, built during the Soviet period, have been extensively rebuilt for permanent living; and (2) new estates of single-family housing have proliferated around Tallinn. People living in both of these types of area depend almost exclusively on private transport.
- Secondly, the public transport system is not convenient and efficient because of its low frequency and slow speed, in addition to which the public transport systems of Tallinn and the suburbs are not integrated.
- Thirdly, the parallel and dramatic increase in car ownership over that in the late Soviet period, enables commuters to use private rather than public transport. However, there are still only thirty cars per hundred people in Estonia today, which remained lower than Western countries (Estonian Statistical Office, 2003).

The hypothesis that out-commuting from Tallinn decreased in the 1990s because of the collapse of agricultural production (which had attracted commuters in the Soviet period) in suburban areas was rejected: the number of out-commuters was similar in 1982 and 2000. This means that out-commuting from Tallinn is likely to have new underlying causes, the most important of which is probably related to the relocation of industrial enterprises from Tallinn to nearby communes, due to the rapid growth of the service sector in Estonia's capital city. The growth of the service sector in Tallinn has led to competition for land, which has resulted in industrial enterprises leaving the city. These businesses do not move far from Tallinn, as they want still to remain close to the capital and its ports. Many of the employees continue to work in these relocated enterprises but have not changed their place of residence, and are hence now out-commuters.

Hence, it has been concluded that suburbanisation has had a greater impact on the increase in in-commuting to Tallinn than has employment change in the suburbs, although both have contributed to the increase in the number of commuters compared to the late Soviet period.

The background situation presented here directly relates to the objectives of the SMILE measures and the wider transport policy of Tallinn city and its limitations.

Overview of the local Institutional Structure

The City of Tallinn is responsible for planning of the route network, planning of the service level, coordination of time schedules, ordering of services and providing information to passengers. The transport services are currently procured from two city-owned companies (TAK and TTTK) and one private bus company (MRP) all of which are partners in SMILE.

The Tallinn City Council has approved the "Development Plan for the Public Transport" and is actively promoting better public transports along this plan.

Tallinn City Council is a representative body of Tallinn. It is a local government unit, elected by the voting people of the city on the basis of the Election Act of the Local Government Council. Tallinn City Council is independent in deciding the matters in the competence of the local government and acts in the interests and the name of the citizens.

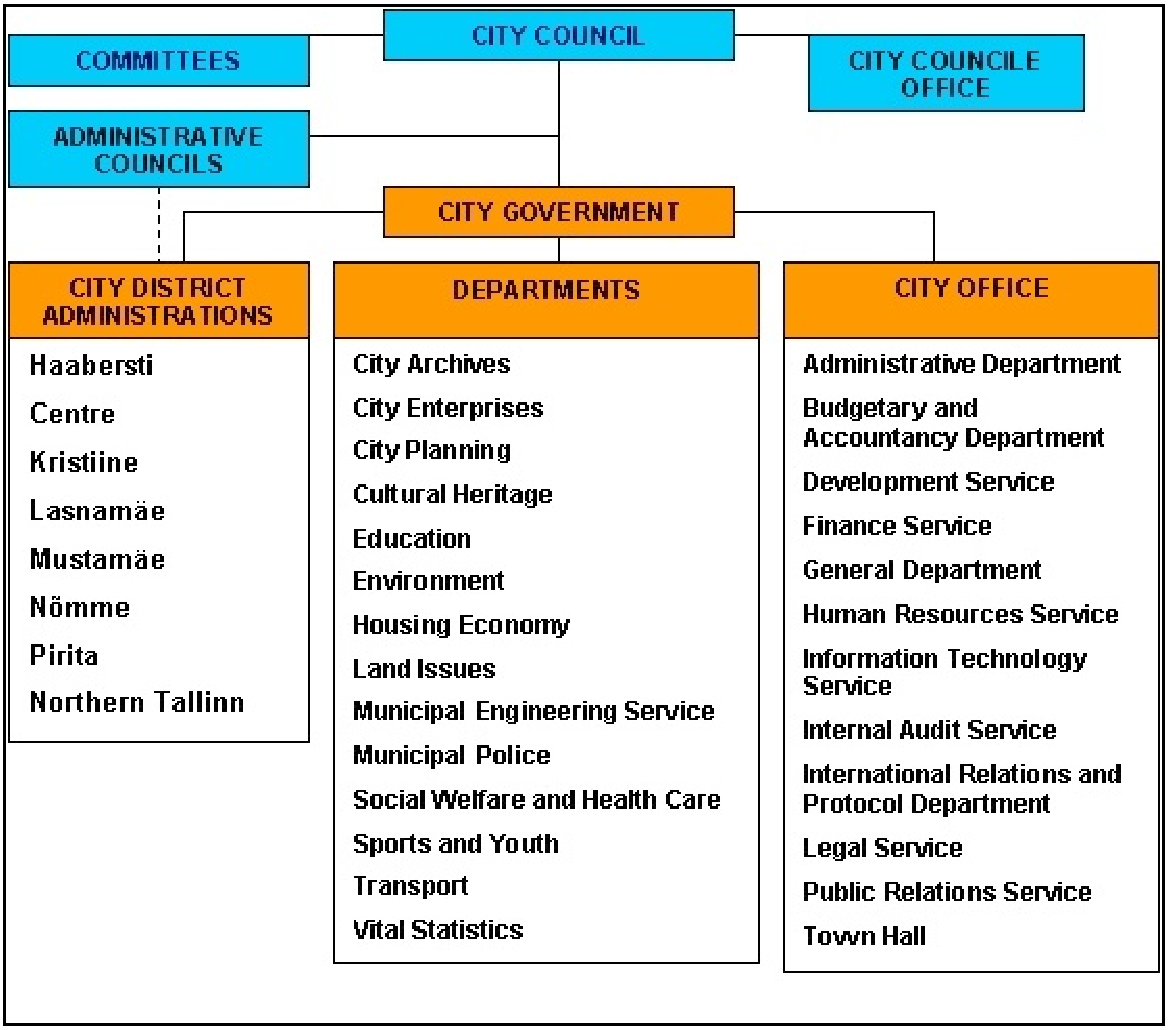


Figure 4.3.1: Organisational Structure of the Local Government in Tallinn

The City Government is the City Council's executive body. The City Government fulfils the assignments given to it by legislative drafting, economic activity, control and the involvement of the residents. The Tallinn City Government consists of a total of seven members: the Mayor and six Deputy Mayors.

The city districts are administrative agencies (8 agencies) whose statutes, structure, personnel, salary levels and conditions are approved by the City Council upon the proposal of the City Government. The government of each district is managed by an Elder, who is appointed by the City Government, upon the proposal of the Mayor and after having heard the opinion of the Administration.

Figure 4.3.1 provides a comprehensive overview on the structure of the local government of Tallinn. The various City Government departments responsible for each policy sector are clearly depicted, along with mainly administrative responsibilities of the City Office.

Sustainable public transport development in Tallinn is based on following policy documents:

- Transport Development Plan for 2006-2013
- Public Transport Development Programme for 2006-2010
- Tallinn Traffic Development Plan for 2005-2014 (some preparatory work done but the document is not officially completed)
- Development plan, service level standards and investment and financing program 2004-2010 for Tallinn public transport within the common ticketing system (adopted by the City Council on June 19, 2003)
- Preparation of planning and financing principles for integration of public transport services in Tallinn and in neighbouring municipalities of Harju County.

The local project partners pointed out important details concerning the institutional and political background in Tallinn, which directly affects transport policies and their results. There is (and will be due to specific circumstances in the local politics) a long term continuity for the political party currently in power. Further residing on the issue of continuity, the transport policy team in the municipality are permanent employees (the equivalent of civil servants) and changes in the personnel of the transport departments are not seen in the near future (the lack of desired expertise in the labour market is also an issue here). These two factors ensure that, on the institutional level, the circumstances that helped the implementation of SMILE measures will continue with minimal change, with the exception of course the lessons learnt from SMILE and can be readily utilised in similar projects in the future for Tallinn.

Transport Background

Since the independence of Estonia in 1991 Tallinn has experienced large changes. First the economic downturn and then the rapid economic growth have imposed large structural changes on the city and its transport system. The number of private cars has been growing rapidly and the collective transport network has not developed in the same pace as the private modes, facing huge competition. Between 1990 and 2000 public transport use fell from 250 to 94 million journeys per year and the modal share of the public transport in Tallinn dropped from 77% to 31% (SMILE, 2008).

The local project manager in Tallinn provided the following points that highlight further the public transport situation in Tallinn in prior to the start of SMILE:

- The renewal (refurbishment) of PT bus fleet was very slow;
- No clean vehicles were introduced;

- The average age of the bus fleet was 13 years, the trolleybus fleet was 14 years and the tram fleet was 21 years;
- National government did not subsidise public transport, the local government recovered 57% of PT expenses and the big PT companies owned by municipality were not cost-effective;
- Trolleybus system had not been closed in 1980s like it was in many European cities, but political pressure to close trolleybus traffic emerged again;

Furthermore people were not ready to change the convenience of their cars for any public transport alternative. There was no political will to invest in improving PT service and quality levels. A Park & Ride pilot project was launched in 2002, but, due to insufficient planning, it did not prove very successful. It was also quite difficult for cyclists to travel through the city, as cycle lanes were far from adequate for the demand.

No electronic information system in the “old vehicles” and in PT-stops had been implemented. Public transport was too crowded and the public had the impression that the ticket price and service quality ratio was unbalanced because the “real price” of fares had increased, while service level had not followed the fare increase. Bus or PT lanes covered only 3.5 km from the total city road network (Laiksoo, 2008). According to passenger survey carried out in 2003, 68.9% of public transport passengers were satisfied with public transport, but only 35.8% of passengers were satisfied with PT information provision.

The increasing demand for road space, the reasons for which have already been discussed, is further demonstrated in Figure 4.3.2. It is clear that the vehicle-kilometres in Tallinn have been increasing since 1996, showing a 70% increase in a decade.

The reverse trend is observed in Figure 4.3.3 for PT passengers since 1993, namely a significant decrease. However, in recent years the passenger numbers do not seem to have decreased, but have stabilised. This can be seen as a positive development, a forerunner of increase, given the increasing fuel prices and the public transport initiatives for the city of Tallinn.

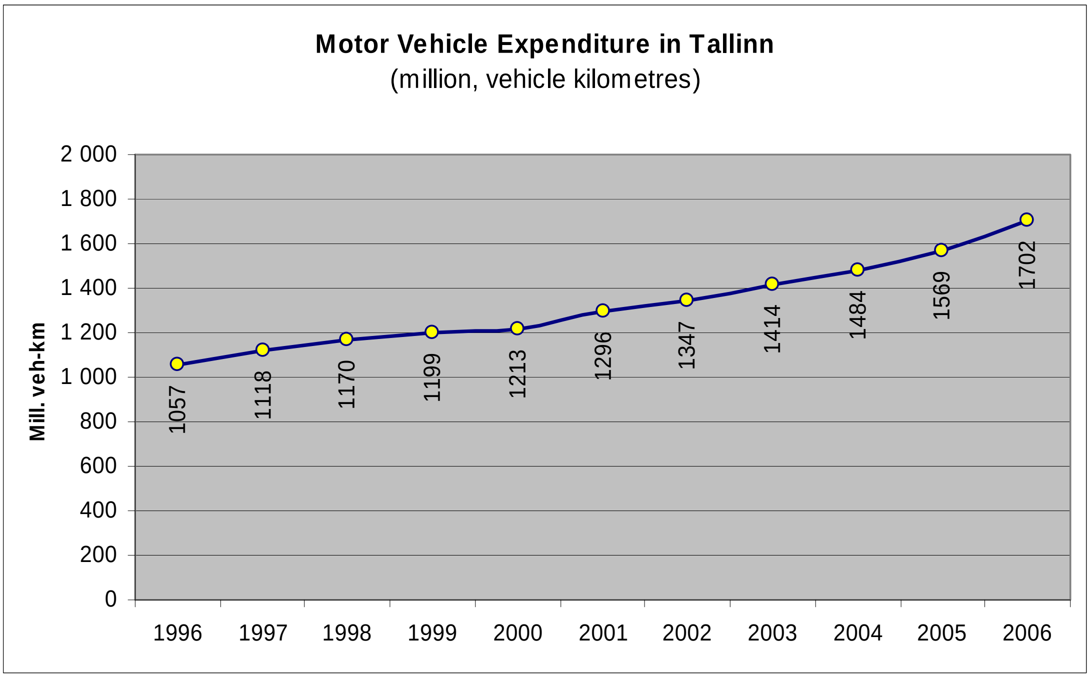


Figure 4.3.2: Increasing Overall Transport Level in Tallinn

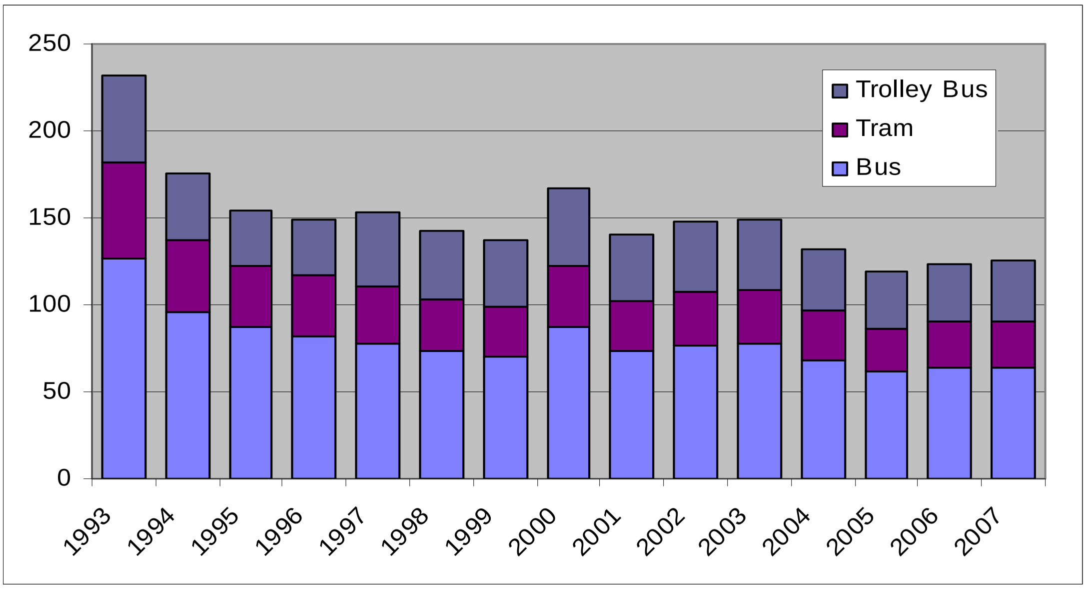


Figure 4.3.3: Number of Public Transport Passengers in Tallinn

The opposing trends, of increasing car mileage and decreasing PT passenger numbers, starting from a base in 1997 are further illustrated in Figure 4.3.4. It is observed that there is a steady increase in the car mileage, whereas the PT passenger number varies significantly, with an overall downwards trend. Further analysing the demand for road space by private cars, it seems from Figure 4.3.5 that the real increase in traffic stems mostly from commuting. The suburbanisation process in Tallinn, which has been described previously, explains the commuter traffic growth in Figure 4.3.5.

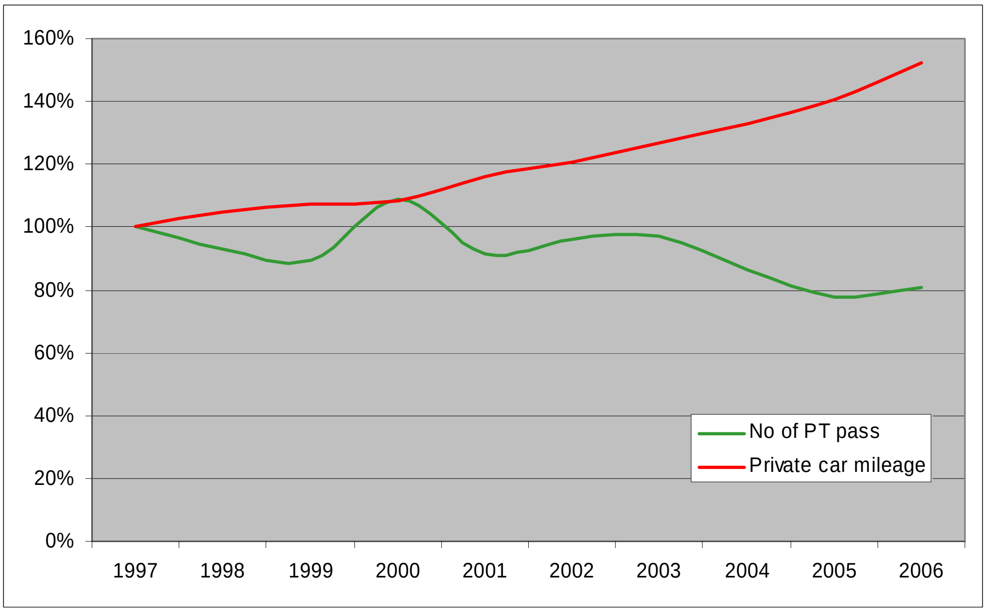


Figure 4.3.4: Private car mileage and PT passengers

The of cost parking, illustrated in Figure 4.3.6, is another factor that may affect the traffic conditions. It is noted that these costs are relatively high compared to other European cities of similar size. Increased tourism in Tallinn (a probable reason for high parking costs) and the narrow "medieval" streets in the old town add to the transport picture for the centre of Tallinn. All these factors may also partly explain the lower traffic growth in the core city centre.

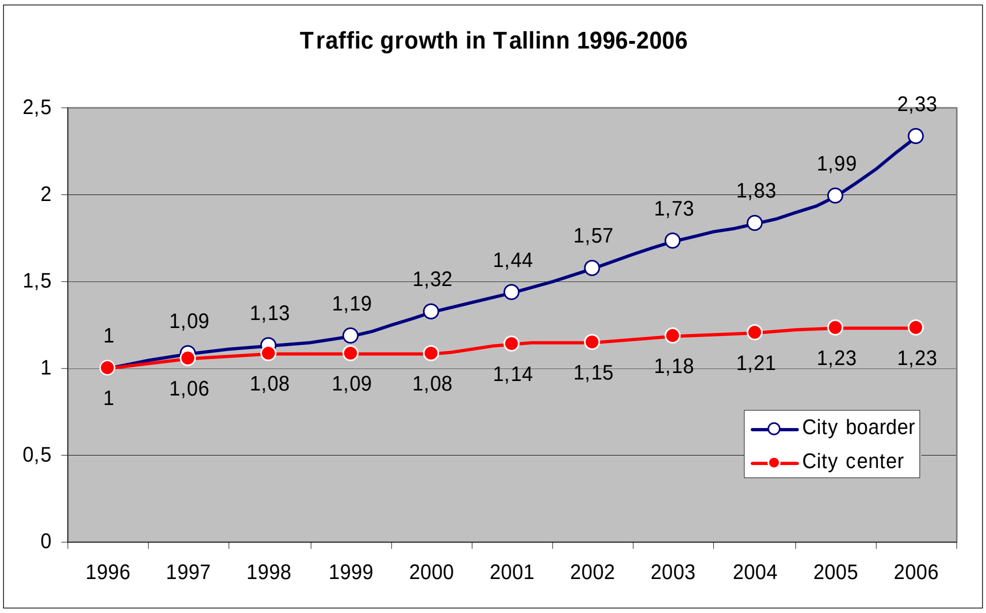


Figure 4.3.5: Traffic Growth in Tallinn

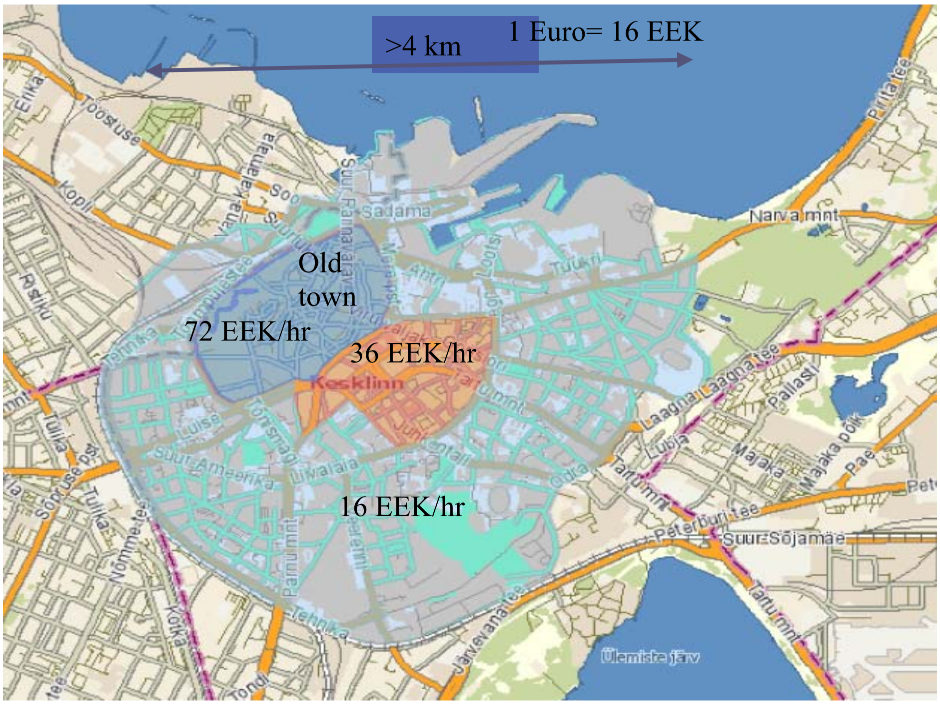


Figure 4.3.6: Parking Cost in the Centre of Tallinn

A complete illustration of the transport background in Tallinn should involve another two pieces of transport infrastructure, the tram network and the park and ride. Figure 4.3.7 shows the Park and Ride location and the relevant bus route. It should be noted that Park and Ride is highly complemented by the SMILE measure 12.5: "Public transport priority system in Tallinn".

Figure 4.3.8 presents the current Tram network (blue line). The other routes indicated in this figure are planned extensions of the current Tram network. It is obvious that these extensions of the Tram network are very significant for the size of the current network and the size of the city. It is clear, as also stated in the interviews, that the Tram has high priority within the transport policies of the city.

Figure 4.3.7: Park and Ride

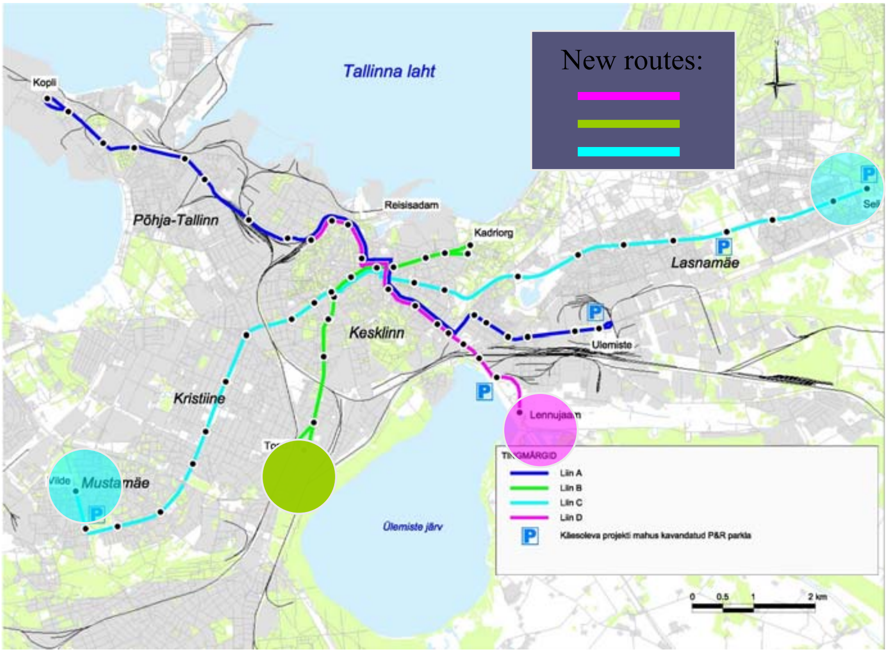


Figure 4.3.8: Existing Tram Network and Planned Expansions

The existing projects and projects that are planned for the near future by Tallinn local government are:

- MAX project – Successful Travel Awareness Campaigns and Mobility Management Strategies
- Wi-Fi equipped School Bus

- Developing P&R and School Bus
- Selecting suitable alternative fuel (ethanol, bio-diesel)
- Real-time information system - improving passenger information at PT stops
- Modern communication system in PT fleet and traffic management unit, optimising traffic management.
- Mobility Management – promoting PT and raising awareness improvement of visibility and security of crosswalks and bicycle tracks
- Eco-driving training program for bus drivers and their trainers
- Marking routes for smooth freight and city logistics
- Bus lane and red light cameras
- Improve traffic monitoring/management
- Expanding PT priority system
- Modelling route network on the basis of actual demand

It is noted that two of the projects planned by Tallinn Municipality are the continuation of the SMILE measure. Furthermore, most of the other projects are very similar to SMILE measures implemented in other cities and continuity has been achieved within the umbrella of the CIVITAS programme as Tallinn is Tallinn is a lead city (but not co-ordinator) of the CIVITAS MIMOSA project which will run from 2008-2012.

4.3.2 Direct Impacts

The following sections briefly set out an analysis of the direct impacts of the measures in Tallinn. This has been limited in scope in comparison to the corresponding sections for Malmo and Norwich for two reasons:

- Firstly, only two very closely related measures were implemented in Tallinn and because of the close synergy between these measures they were evaluated together. This evaluation has already been presented in a standard summary format in section 3.3.1.
- Secondly, as will become apparent, the impact of the measures on the quantifiable indicators was rather modest and outweighed by the changes in external factors such as the rapid rise in fuel prices in 2008 and the wider economic slowdown that happened in the second half of the same year.

The Impact Area

The SMILE transport measures have an impact over an approximate range of 10 km (centred around Tallinn city centre). The geographical characteristics of the area (to the north there is the sea and to the south side a lake) force people, who live in the suburbs (either west or east of the city), to cross the city centre (instead of going around it), in order to travel to work, to school or to leisure activities. Therefore, the measures may have indirect effects further than the obvious implementation area. However, within the wider area of influence the impact is only on certain lines and is therefore quite diffuse and limited.

4.3.3 Energy and Environmental Impacts

The bus priority measures would be expected to generate energy savings for buses, due to the smoother traffic conditions, but preliminary results are marginal. Furthermore, this measure may have opposite effects for private cars (at least in the short term), which would reverse all the positive environmental effects that stem from reduced fuel consumption in the absence of a significant modal shift.

In addition there was a conflicting effect linked to the renewal of the bus fleet. This would have meant that comparison of the fuel consumption data would not have been on a like-for-like basis, and the object of the evaluation is the PT priority and information systems, not the new buses. These external factors are likely to outweigh the impact from the SMILE measures.

In terms of the emissions data that are presented for the transport system in Tallinn, the dominant factors appear to be the changes in overall traffic flow and the ongoing fleet renewal which is slowly bringing new, more energy efficient vehicles to the market, rather than the impact of the SMILE project measures.

4.3.4 Transport Impacts

The impacts on the transport system have been assessed using a set of indicators for the overall situation in Tallinn.

The results show that the majority of vehicles on the selected priority transport route are cars both before and after the introduction of the priority routes. A slight reduction in car traffic was detected on this route, but it is not possible to isolate the cause of this as the effect of the SMILE bus priority measure to drive modal shift. Instead it is more likely that it is an effect of the increases in fuel prices that occurred over the same period.

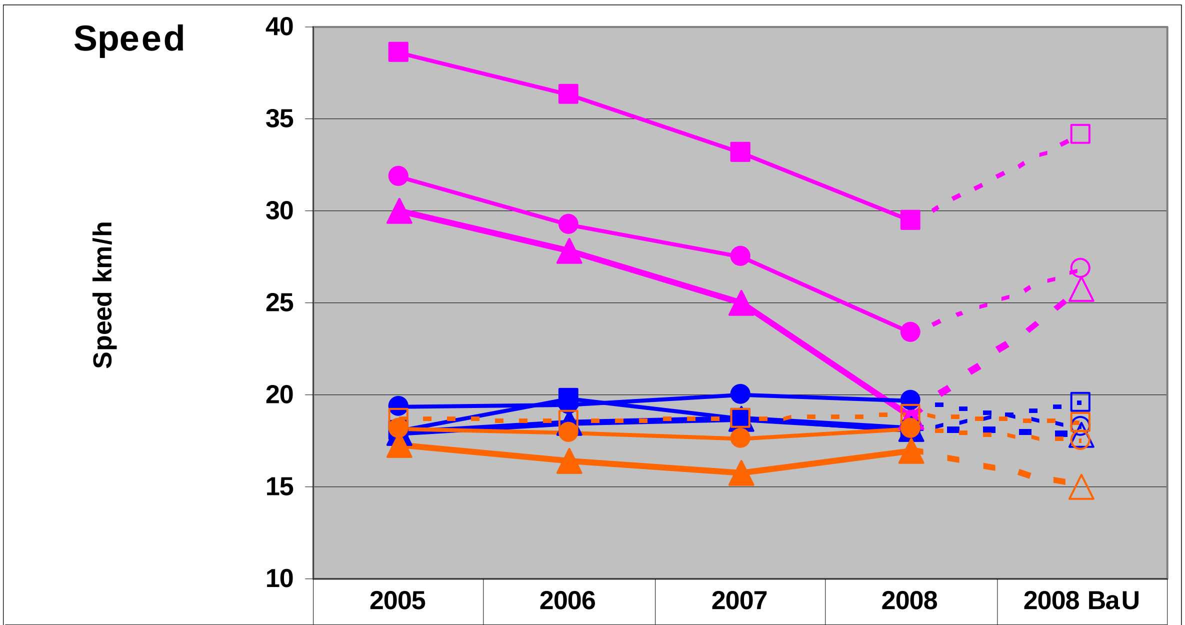
The vehicle speed data on the selected priority transport route do show an impact which is probably, at least partially, a result of the SMILE project. However, the impact appears to be one of adding a restriction to the speed achieved by cars using the route, so adding to the trend of slowing car traffic over recent years. The reason that this can be attributed to the SMILE measure is that the previous reduction in speed was as a result of increased traffic levels in the preceding years, whereas in 2008 the trend of increasing overall traffic levels had been reversed slightly, yet the reduction in speed continued. The impact on bus speeds has been marginal, so that although providing the buses with an additional relative benefit in comparison to the cars using the route it is achieved in rather a negative way.

It is also noteworthy that the average car speed in the evening peak has decreased to the level of the public transport modes, suggesting that the public transport modes should be competitive to car travel in this aspect. The situation is not quite the same for the morning peak period, but if the trend of decreasing car speed continues then this situation might be replicated in the morning peak within a couple of years. The off-peak comparison is less of a concern since car users do not impose as much external cost (contributing to congestion and all the externalities that stem from it) to others as in the peak periods.

The mode which appears to have benefited most is trolleybus, with a slight increase in peak period speed compared with the business as usual projection.

The achievement of parity between bus and car speeds through a reduction in car speeds is likely to reduce overall energy efficiency and increase emissions in the short term until such time as the measure drives the expected shift from car to public transport

This situation is shown in Figure 4.3.9, in comparison with the business as usual scenario.



	2005	2006	2007	2008	2008 BaU
car, morning	31,8	29,2	27,5	23,4	26,8
car, off-peak	38,6	36,3	33,1	29,5	34,1
car, evening	30,0	27,8	25,0	18,8	25,8
bus, morning	19,3	19,5	20,0	19,7	18,3
bus, off-peak	18,0	19,8	18,7	18,0	19,6
bus, evening	17,9	18,5	18,7	18,2	17,8
trolley, morning	18,2	17,9	17,6	18,1	17,5
trolley, off-peak	18,7	18,6	18,7	18,9	18,5
trolley, evening	17,3	16,4	15,8	17,0	15,0

Figure 4.3.9: Average vehicle speed in peak and off peak

The impact of the preceding changes to modal split and average vehicle occupancy were further clouded by changes to the organisation of the bus routes, which meant that a clear before – after comparison was not possible. Changes to the bus routes in the city centre were necessitated by significant development projects next to some of the main routes during 2008 and even where routes were not changed the frequency of vehicles varied along those routes, with more buses running in 2007 than 2006, when there had been a short term restriction in supply.

These observations emphasise the difficulty of implementing and evaluating even a significant upgrade to the public transport system using a living and developing city as a form of laboratory, as there are so many external variables which cannot be controlled. Whilst it might be possible for the impact of the external effects to be accounted for using sophisticated modelling techniques, such traffic models do not exist in many East European cities.

4.3.5 Public Perception Impacts

Data about the perception and awareness of the public transport measures were obtained through two surveys with 400 members of the general public conducted in November 2005 and then repeated in April 2008.

Public Transport Priority Measure

Awareness levels of the public transport priority increased markedly, from 18.8% complete awareness to 50.8%. The increase was almost entirely from the partially aware group, and in both surveys around a third of the population remained unaware of the public transport priority measure.

Acceptance results among those aware of the measure were similar in that there was a shift to high acceptance levels primarily from those who had previously had a moderate level of acceptance, but little change among those who were initially against the scheme, presumably car drivers who feel inconvenienced by the measure and are unwilling to change their travel behaviour.

Comments were received from the respondents in relation to the public transport priority measure and categorised broadly in order to establish the reasons behind the changes in acceptance level and more importantly why around 40% of people do not have a degree of acceptance of the measure. The main comments were:

- 31%: cars use the priority PT lines, indicating a lack of effective enforcement – this may relate to Estonian law where you have to be able to prove who was driving the car in order to issue a penalty notice and CCTV images are not currently admissible for this purpose;
- 13%: Priority lines don't influence the PT service level;
- 11%: The measure has been in operation for too short a time to have an opinion.

Public Transport Information Measure

Complete awareness of the electronic passenger information measure increased from 62% in 2005 to 70.7% in 2008. On initial viewing, this headline appears promising although slightly disappointing. More surprising is the reduction of partial awareness (from 33.8% to 12.8%) and an increase from 4.3% to 16.6% who are not aware of the measure.

There are various possible reasons for this, including complacency, expectations being raised and then not met, and car use becoming more embedded within the culture so that public transport facilities are less visible and maybe even seen but not registered as relevant to them by some members of the population.

Just as for the priority measures, the acceptance levels registered in the survey mirrored the results of the awareness questions. There was a large increase in high levels of awareness from 25.8% in 2005 to 58.2% in 2008, but this is largely at the expense of moderate acceptance levels, and there is actually evidence that high levels of antagonism towards the measure have also increased – from 4.8% to 18%.

Respondents were asked to state the main factors in their opinion that influence the success (or otherwise) of this measure. The answers are shown below, where the relevant reason for the measure not working properly is that many users do not pay attention, though this may be linked to the other comments about inaccuracies or the information not being necessary for regular users.

- 46%: I don't watch them;
- 22%: There is often wrong information (name of the stops are shifted);
- 13%: Advertisements are not interesting;
- 4%: Local people know anyway, foreigners can't understand the information.

Overall Public Transport Quality

The respondents were also asked about the importance of several attributes of PT services. The results are shown in Table 4.3.1. Still in 2008 as in 2005, "time keeping" (adherence to the timetable) is the most important attribute for PT. For all the other attributes, there seems to be a switch from the "important" category in 2005, to the "very important" category in 2008. The biggest increase is for "information in vehicle and stop call" category, providing validation of the SMILE investment. The increased importance attributed to these factors also indicates an increased expectation on the level of service from the public.

Table 4.3.1: Local Authority Policies and Modal Shift

Attribute	Importance	2005	2008
Trip distance	very important	17.8%	46.2%
	important	51.3%	37.7%
	slightly important	28%	13.9%
	unimportant	2.3%	1.4%
	can't say	0.8%	0.8%
Time keeping	very important	58%	64.3%
	important	36.9%	29.7%
	slightly important	4.5%	5.2%
	unimportant	0%	0.3%
	can't say	0.5%	0.5%
Information in-vehicle and stop calls	very important	26.6%	62.4%
	important	60.1%	27.5%
	slightly important	9.5%	7.4%
	unimportant	3.3%	2.5%
	can't say	0.5%	0.3%
Vehicle comfort	very important	23%	54.5%
	important	48.2%	39.5%
	slightly important	23.2%	4.9%
	unimportant	3.8%	0.8%
	can't say	1.8%	0.3%

4.4 Potenza

4.4.1 Context

The transport situation in Potenza is dependent upon both the city (Commune) and regional (Regione) authorities, both of which are partners within the SMILE project.

The existing sustainable urban transport plan was old and based on inadequate data to inform up to date transport planning initiatives.

In the period leading up to SMILE there was a certain amount of flux in the transport policies that were in place as attempts were made to update the plan. During 2003 and 2004, working with the then public transport provider, CTP, a feasibility study was conducted into the implementation of a limited traffic zone within the historic city centre, associated with a number of supporting measures.

This feasibility study was based around the following measures:

- Definition of the location of Limited Traffic Zone boundaries, of its regulations and of the access and exiting roads;
- Definition of the location of areas and route to be assigned as pedestrian only areas;
- Implementation of Park and Ride facilities;
- Definition of the new circulation scheme in the Limited Traffic Zone coherent with the new pedestrian areas and with objectives to improve vehicle circulation, limit access to the ZTL and contain conflict points between vehicles and pedestrians;
- Reorganisation of parking in the historical centre in order to maximize parking supply on secondary roads, reduce it on main roads and contain the critical aspect index;
- The reorganisation of local public transport; particularly with regard the level and frequency of the service in the study area and the need to increase the connections between Piazza V. Emanuele and the historical centre.

And involved a detailed modelling exercise that validated the feasibility of the strategy, quantified the potential impacts and highlighted a number of priorities as follows:

- Vehicle parking: The results from the modelling exercise support the findings from the surveys made on the parking demand: demand for parking in the city centre outweighs supply of spaces. The growing extent of this problem suggests that this is a priority for Potenza.
- Private vehicle traffic: from a functional point of view, there were no serious problems on the main road network. However, the centre's main arterial routes were often very congested. This circumstance should not be underestimated considering the "vulnerability" of the road network. Traffic limitation in these areas should be considered a priority.
- Pedestrian areas and road safety: With regard to walking in the centre, the entire road network appeared unsafe due to inadequate roads, an almost complete absence of pedestrian pavements and inappropriate or illegal parking. Vehicles and people are therefore forced to share the same space making the centre of Potenza a very unsafe place, particularly for pedestrians.
- Local public transport: despite the good level of public transport services covering much of the urban area in Potenza, public transport is clearly not well used. Currently only 6% of the morning peak hour modal share is taken by public transport some action to address the modal split is urgently needed.

A conclusion of this analysis, based on the above critical findings, led to the development of a set of priorities:

- Promote the pedestrian component in centre: restore the pedestrian environment or areas where pedestrians have priority over vehicles, making the city centre more fluid and more pleasant for everyone, reducing intrusion of vehicles in zones not made to accommodate them.
- Limit the number of vehicle movements entering the historical centre of Potenza.

- Foresee long term parking: the reduction of long term parking means increasing the parking capacity of the zone and, therefore, increasing the accessibility to short term parking vehicles (for example for shopping or entertainment), this could also mean restoring spaces destined for other uses.
- Promote use of local public transport: even out modal division between private and public transport vehicles by, on one hand, reducing the number of circulating cars leading to a reduction of congestion levels, and on the other hand reducing and managing parking demand in the zone where the parking problem is particularly serious.

Having developed this set of priorities there were two local elections within a period of four months, which resulted in a change of politicians in charge of the process. The newly appointed politicians were equally committed to addressing the issue of sustainable transport within the city. However, their priorities and strategy designed to reach the same goals were significantly different, moving away from the limited traffic zone to a more balanced package of measures as reflected in the SMILE project measures, which illustrate a mix of upgrade to the public transport offering and an increased emphasis on mobility management.

However, before this could be reached the period of flux associated with this change of emphasis needed to be completed. CTP, as provide of public transport had been a partner in SMILE and had been closely associated with the idea of the limited traffic zone. However, the relationship between CTP and the public authorities in Potenza had broken down and CTP were replaced in their role by an alternative public transport provider, Co.Tr.A.B. This had a severe impact on the implementation of SMILE as there were a large number of linkages that needed to be rearranged, covering a much wider range of issues than merely the contractual arrangements for SMILE, where Co.Tr.A.B. replaced CTP as a project partner.

One particular change that needed to be made related to the purchasing arrangements for the CNG buses in measure 5.5, as Co.Tr.A.B. was not able to stick to the previous arrangement where CTP, as the transport operator, were due to purchase the vehicles. In the end alternative arrangements were reached with Co.Tr.A.B. being merely the operator, rather than owner, of the new vehicles.

All the changes to the planning meant that initiation and pre-planning for mobility management and car pooling, which involved a detailed survey to inform the measures and help with pre-publicity were well behind schedule.

4.4.2 Background Research

All elements of the project in Potenza have been heavily researched prior to implementation:

- The issue in relation to the CNG buses initially related to product availability and costs, and subsequently in confirming an appropriate technical specification and then with the formal tendering procedures, all of which took much longer than expected.
- For the car pooling measure and the mobility management office a detailed mobility survey was conducted both within the city and the wider region. This provided an excellent picture of the mobility patterns in the area that needed to be changed, but then on top of that a significant amount of research was required on how to organise the measures.
  - The car pooling system was purchased from a range of available software packages after a comprehensive evaluation, but the standard system needed modification to in order to ensure it was suitable for the local needs, particularly the local incentive schemes. This was followed by an intensive testing phase prior to launch.

 - A mobility management office existed and worked OK, but the role of the project intervention is to introduce a new concept in order to make it work better through a more integrated customer proposition over a broader area. This was a complex task with wide responsibility and a need to liaise across the authority. Bureaucracy was a hindrance to making this appointment.

- For the DRTS pre-research had been conducted as part of separate project. This was general research that provided examples of other good practices, for example successful ideas from other DRTS services in relation to publicity, recruitment and registration of public transport users and structure and content of the website. However, in the end there was a need for more specific preparatory information for the selected target area. This was developed for the whole city and the wider region, with the aim of providing a better service in the end.

The desire to conduct this research is understandable, as there are plenty of examples where premature release of a new technology or system has led to subsequent lack of trust with the final implementation as a result of initial problems leading to a tainted perception. However, in a project where evaluation of the demonstration is a key element, there is a need to design a test system in a way that can both help the development of the measure, for example through a detailed assessment of potential user needs and also provide useful evaluation data, even if only for a limited sample. There is no doubt that when combined with the organisation delays that occurred in the formation of the project team, this focus on research has been a contributing factor to the delays due to a desire to ensure that the measure is developed to the optimum stage prior to release – a case of aiming for the optimum at the expense of implementing a good measure in the meantime.

4.4.3 Future Impacts

Given that all the measures were heavily delayed in their implementation it is not possible to say with any certainty what their effect will be in Potenza. Public transport in the area was poorly used prior to the project. The introduction of 4 CNG buses for the provision of public transport in the city will not in itself make a significant impact unless they can prove to be popular with the public, help to draw in extra users and increase patronage, so justifying wider investment in the technology. This will need to link in to the wider project activities of mobility management and promotion. The pre-surveys have proved that there is a huge potential to achieve modal shift in the Potenza area, not least because Potenza close to the top of the list in Italy for car dependency and use of car for short trips.

This experience highlights the need for long term evaluation for projects such as this in order to fully understand the value of the investments that have been made.

4.5 Suceava

4.5.1 Context

The economic life of the Suceava is based on small to medium size companies dealing with the wood industry and textiles. Banks and national institutions are also prevalent along with the very important construction sector. Construction has increased during the last two years, not only for residential use, but also commercial building, particularly supermarkets, as part of a strategy to increase the commercial attractiveness of Suceava to the wider catchment area of Suceava County and neighbouring counties. Farming is still very important in Romania and Suceava County, mainly based on small scale, subsistence farming.

There are issues with the quality of the road network and the availability of road space in the city, as its role as the financial and commercial centre of the wider area grows. This situation, combined with the increasing number of cars due to the rise in standard of leaving and disposable income, creates a problematic situation with respect to congestion and parking availability.

ECMT has previously demonstrated the wide range of approaches in different countries to forming sustainable urban travel policies. A logical sequence of the issues should be considered in policy formulation, from the starting point of a clear specification of the objectives of urban transport policy to a number of logical subsequent stages. An example such logical sequence of stages is (PROSPECTS, 2005):

- problem identification,
- target setting,
- option generation,
- model development,
- ex ante appraisal,
- implementation,
- ex post evaluation,
- monitoring and benchmarking.

However, in some contexts it may be unproductive and unreasonable to expect that the decision making process will take a linear path through all the stages mentioned above, particularly given the recent rapid economic development experienced by some of the new accession EU countries. This needs to be considered along with the inherited institutional issues when examining policy initiatives and the decision making process in such locations.

The transport priorities in Suceava are clearly different to those experienced in west European cities and so should be considered from a different perspective, without bureaucratically focusing the examination of a project only to a sequence of policy formulation stages. This is partly attempted here, focusing on the main issues highlighted by those involved in the local project implementation, rather than some policy formulation stages that are not inherent in the Romanian system; (although some of these have now been introduced due to accession to the European Union).

4.5.2 The Transport Situation Before SMILE

From around 1999 the local government started to consider sustainable transport issues. The main problem at the time was that they had an old, poorly maintained public transport system that consisted of a mix of trolley buses and diesel buses which was not designed to meet the changing needs of the local population.

Suceava’s public transport system was critically lacking in investment and because of the poor service was not generating sufficient income to cover costs. A plethora of unregulated private minibus services had come into operation, which was meeting the transport demand, and so diverting income from the fixed local authority sponsored public transport, but doing so in a problematic way in terms of congestion, high pollution from an uncontrolled number of old vehicles and poor safety.

Initial attempts were taken to provide a better quality of public transport in environmental terms and to improve the environmental situation through a trial of a time controlled access restriction in the city centre during a project called ALTEReco from 1999-2002. This was developed further within the CATCH – "Clean Accessible Transport for Community Health" demo-project, which proposed and implemented measures designed to introduce improvements to the public transport, by means of providing more comfortable, accessible and efficient services, using cost efficient and environmentally friendly solutions. During CATCH a large publicity campaign was conducted to promote pedestrian and cycling facilities in the low emission area.

After these initial attempts SMILE has provided the funding and impetus for a much more significant and co-ordinated effort for improving and promoting PT.

The following is list of deficiencies and issues with the local transport situation in Suceava, dating from around the start of SMILE, some of which are addressed through the SMILE measures:

- Deficient road network structure to support the size of the city.
- Narrow streets and poor quality of road surfaces.
- Total lack of relief roads which contributes to traffic congestion in the central and the residential areas of the city.
- Insufficient width of roads and poor location of the blocks of flats (too close to roads to enable widening).
- Insufficient road signage and traffic crossings.
- Lack of parking space in the centre.
- No ring road which would reduce traffic congestion in the city and remove the need to drive through the centre.
- Lack of facilities and special priorities for public transport.

4.5.3 Institutional Background and Decision Making Process

Institutional Background

There is relatively little input from central government organisations, with the only intervention being the need to link local plans to regional plans and the consultation role undertaken by the Environment Protection Agency. In this section, we focus on institutions that according to our discussions with the project implementation team play the most significant role in the decision making process.

Suceava Municipality and the Local Council of Suceava City are jointly responsible for the design, finance and implementation of Land-Use and transport planning for the city of Suceava. This includes roads, local infrastructure, traffic lights, urban development plans, travel plans and Public Transport plans. In addition these organisations establish local policies for public and private transport modes, integrate local plans with regional and national plans. The Municipality and the local council do not have responsibility for railway planning or air transportation.

Suceava County Council oversees the integration of local plans with regional plans. The County Council is responsible for air transportation (infrastructure, plans, development and finance). The County Council is also involved in local road infrastructure planning, but only for projects which relate to city bypasses.

The Traffic Police have a consultation role in land use and transport planning. This includes traffic studies, Public Transport routes, road infrastructure, traffic lights, special measures for pedestrian areas and access restriction.

The Environment Protection Agency (EPA) has a general consultation role in land use and transport planning.

The Public Transport Plan (or strategy) for Suceava is implemented by the Local Transport Company and focuses upon the structure, development and finance of the LTC. This plan is reviewed on an ad-hoc basis, whenever new trends or economic changes prompt revisions to the plan.

The land-use and transport strategies for Suceava are assessed through the measurement of a number of key indicators. These are listed below:

- Measuring reductions in pollution levels
- Air quality improvement
- Noise reduction measurements
- Measuring traffic congestion levels
- The impact of measures on public satisfaction
- Modal share of public transport
- The numbers of private cars
- Uptake of alternative fuel use

The Local Decision Making Process

This section expands the analysis on the institutions mentioned above and the decision making process. All the decisions about transport, as mentioned above, are taken by the local city council. The Mayor of Suceava (head of the Municipality) is of key importance in this process. He can ask permission or make proposals to the local council, who in turn decide on the issues and are responsible for setting the budget and all other relevant activities. The Municipality has the responsibility for whole (transport) infrastructure in the city.

The local government (Municipality and city council) do not directly depend on the national strategy or central budget. Most of the money that the city council spends is raised locally and only a small part of the budget comes from the central government. However, it was noted that many things have changed and are still changing after Romania joined the EU (e.g. introduction of tendering procedures, new rules for vehicles, different funding sources etc).

The project is implemented by the European Accession department of the Municipality, who are dealing with several European projects concerning environment and infrastructure. There is no transport planning department in the Municipality, although there are departments responsible for PT routes, that deal with private companies and which perform maintenance on public transport infrastructure.

The other institutions (except the local government) have no direct involvement in the decision making process and the budgeting of the local transport projects. However, EPA and LTC are traditional partners in projects and are consulted regularly, contributing to changes and improvements where necessary. The LTC is owned by the local council, and is essentially another department of the Municipality working for common projects, in this case SMILE. LTC is not involved at the planning stage, determining for example how many buses had to be bought. However, LTC were informed and consulted about LPG, but the issue still took place on the Municipality’s instigation. The project team noted that LPG is very popular in Romania, because it is cheaper than other fossil fuels. Nevertheless, the consultation about LPG has been a very long process, since there were open discussions and debates, because the local government cannot just impose LPG buses.

Concerning its relations with the private sector, the local government does not have to involve or consult the central government at all. The planning is controlled at local level as, for example, are the permissions for construction and other planning issues such as connections to existing roads and utilities. Therefore, the city council has considerable independence and “power” at its disposal. It was noted that a city council decision helped the implementation of SMILE measures, by purchasing 15 extra buses.

4.5.4 Transport Impacts

Modal split and its dependency on levels of car and bus use have formed a key indicator throughout the city for the group of public transport measures and also more specifically in the city centre for the low emission zone. The influences on these usage levels are a complex mix of economic factors as well as the influence of local transport provision.

By far the most concentrated influences on the modal split in Suceava are the legal / regulatory measures introduced by the municipality, specifically the regulation of the previously unregulated minibuses, which led to the removal of the majority of these services, and the LEZ restrictions within the core of the city centre.

However, these impacts do not necessarily reflect the wider picture in the suburbs and the region around the city, where economic development and increasing affluence have driven a huge increase in car ownership and use. This effect was particularly noticeable in 2005, before the reforms of the bus services that were brought in during SMILE. The trolleybus service was becoming increasingly unreliable, the buses were unattractive, the unregulated minibuses were still operating and the improving economic situation was driving car ownership and use.

In the period from early 2005 to late 2006 (i.e. the first 18 months of SMILE) the modal split was observed to move substantially in favour of cars and the rest of the project implementation was focused at trying to reverse this change. The changes to the public transport system have driven a huge increase in use of the bus system in Suceava. This is partly because by those people who previously used the unregulated minibuses and the trolleybuses now use the modernised bus services that are available to them. However, by 2008 there was also evidence that the car mode share was decreasing, although it remained at a much higher level than in 2005.

Linked to this reform is the economic performance of the public transport system, which is now able to operate at a profit, and which should lead to it being able to continue to increase its modal share through ongoing improvements.

From this information it is clear that the control of the city authorities within the city area has provided a strong and successful influence within the city area, but without a wider policy covering the region, not to mention national policies, then the impact of such measures can be overshadowed. However, there is another policy that would also help to contribute to the control of cars within the city that has not yet been explored – namely parking control, particularly within the city centre, but also potentially as part of development control strategies for future developments.

4.5.5 Energy and Environmental Impacts

Energy Use

Energy was most closely monitored / modelled for the measures that involved changes in fuel type, which in Suceava involved the promotion of LPG within public and private sector fleets and the conversion of the new buses to LPG.

It is important to start by noting that the new Euro 3 diesel buses had worse energy consumption (17.5 MJ/vkm) than the old buses (15.0 MJ/vkm) due to their larger capacity for passenger transportation and heavier weight than the previous buses. When these new buses were converted to LPG, this improved the performance of this energy efficiency indicator (13.8 MJ/vkm) by 8% compared to the original pre-Euro buses. The renewal of the fleet in SMILE resulted in a final fleet with 15 new diesel buses and 15 new LPG buses, the former being less energy efficient and the latter being more energy efficient.

The results from the introduction of LPG into the taxi sector reflect the well known variation between the different fuels in terms of vehicle energy efficiency. For comparable vehicles diesel and LPG were found to be on a par in energy terms, and around 15% better than gasoline. The low energy density of LPG when considering fuel consumption is purely in terms of volume consumed, but which has often had a psychological effect on the end user as fuel is purchased by volume and even with a lower price per litre it can feel like LPG is actually a less efficient and more expensive option, although the data do not bear this out.

Across the taxi fleet as a whole the switch to LPG reduced energy use by about 3.7%.

CO_2 Emissions

The annual reduction in CO_2 emissions as a result of converting 15 of the new diesel buses to LPG was 371.25 tonnes CO_2.

For measure 5.7, where LPG was promoted to the public and fleet users, particularly taxis, then further reductions in CO_2 emissions were found as a result of the use of LPG. These were estimated to be 360 tonnes CO_2 per year, of which over half, 206.5 tonnes, was realised from the taxi fleet.

CO Emissions

The annual reduction in CO emissions as a result of converting 15 of the new diesel buses to LPG was 298 kg CO.

For measure 5.7, where LPG was promoted to the public and fleet users, particularly taxis, then further reductions in CO emissions were found as a result of the use of LPG. These were estimated to be 789 kg CO per year, of which over half, 452 kg, was realised from the taxi fleet.

NOx Emissions

The annual reduction in NOx emissions as a result of converting 15 of the new diesel buses to LPG was 6163 kg NOx.

For measure 5.7, where LPG was promoted to the public and fleet users, particularly taxis, then further reductions in NOx emissions were found as a result of modelling the use of LPG. These were estimated to be 260 kg NOx per year, of which over half, 149 kg, was realised from the taxi fleet.

Particulate Emissions

The annual reduction in PM_{10} emissions as a result of converting 15 of the new diesel buses to LPG was 386.4 kg PM_{10}.

For measure 5.7, where LPG was promoted to the public and fleet users, particularly taxis, then further reductions in PM_{10} emissions were found as a result of modelling the use of LPG. These were estimated to be 252 kg PM_{10} per year, of which over half, 144 kg, was realised from the taxi fleet.

In parallel with the emissions results, air quality measurements taken by the EPA in the centre of Suceava also suggest a downward trend in the major local pollutants. However, because of the many influences upon pollution levels, identifying a direct causal link to the project, rather than an important contributing factor, is not possible.

4.5.6 Perception of the SMILE Measures

Quality of Public Transport Service

The survey results in the evaluation template for the cluster of public transport measures showed that the perception of the quality of PT services from its users has increased. This is true for almost all attributes between 2005 and 2008.

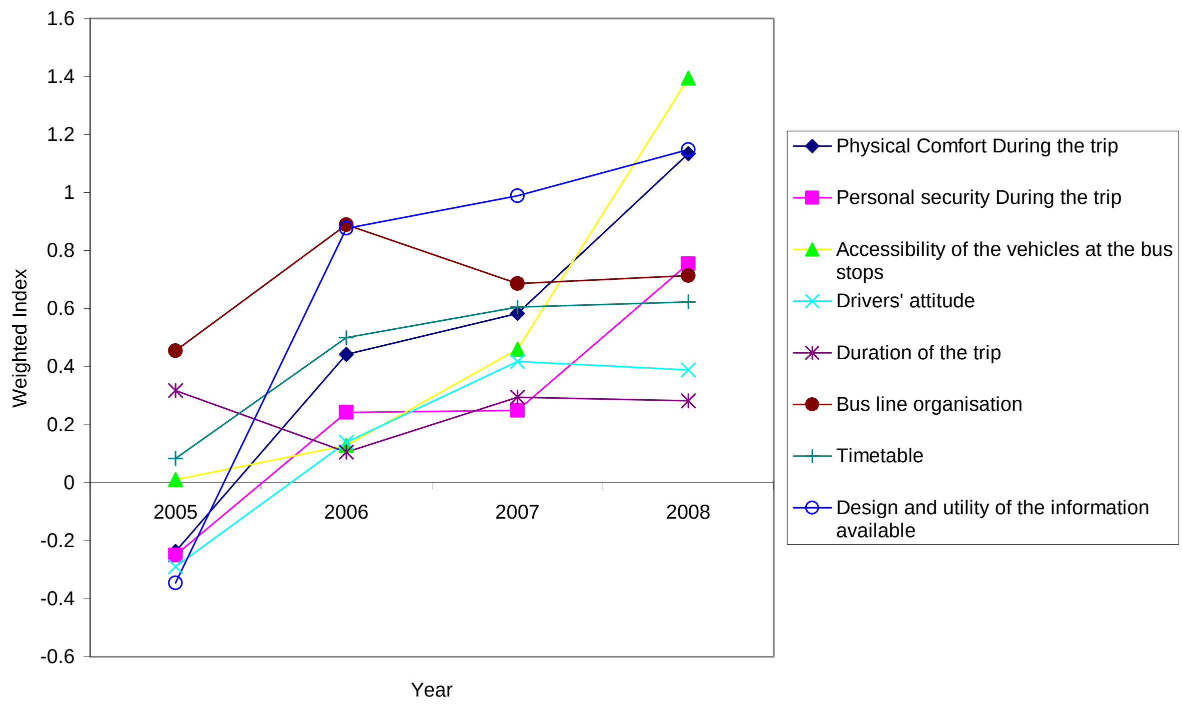


Figure 4.5.1: Quality of PT service described through detailed approaches relevant to the passengers

This effect is supported further by the results of another question in the survey. The respondents were asked to grade (from 1 to 5) the importance of factors that would discourage them from taking a bus (and would subsequently force them to use a private car). This was repeated in 2005 and 2008. The results are shown in Figure 4.5.2.

In general the expectations of the public have increased, with more categories being perceived as very important. There is significant increase in the importance of the “short duration of the trip” and the “flexibility in accessing multiple destinations”. The dramatic decrease in the importance given to the cost of the journey is interesting; presumably related to the changing economic circumstances in the region (SMILE, 2008b). And the importance of the feeling of personal security during the trip has fallen, maybe implying improvements in the issue.

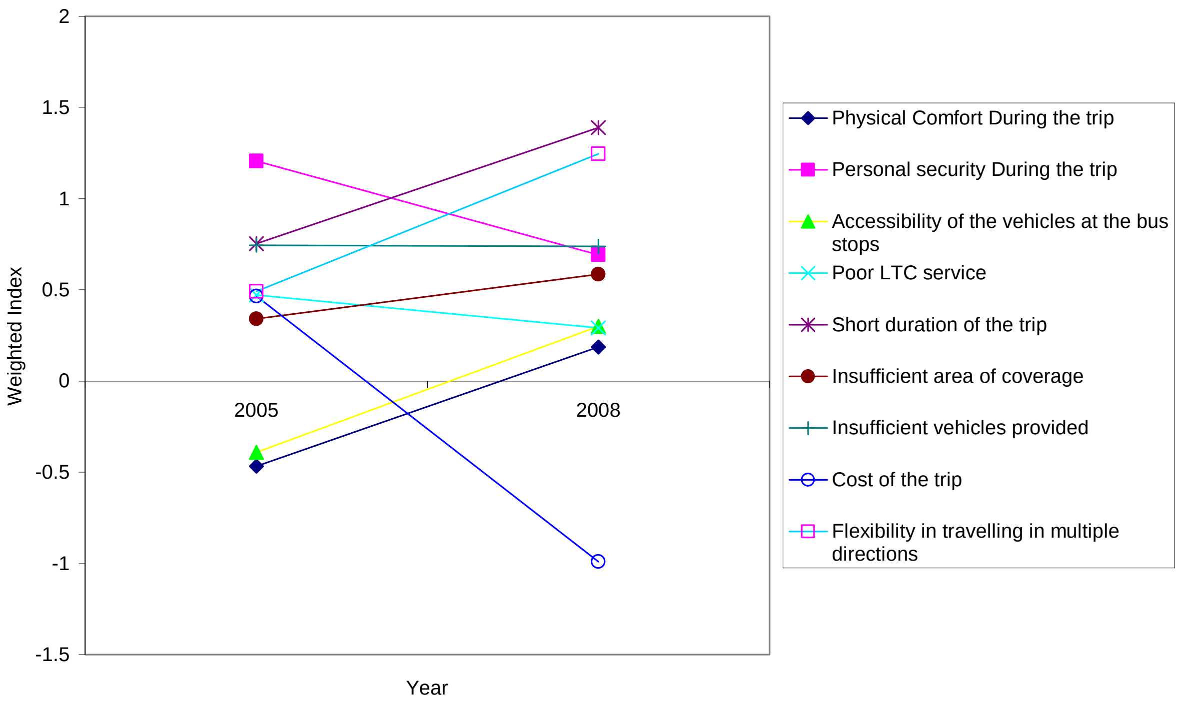


Figure 4.5.2: Graph with weighted index values showing importance of the factors when making a decision with regard to transport mode

Awareness and Acceptance of the SMILE Measures in Suceava

Table 4.5.1 presents the awareness levels for each SMILE measure and the changes in awareness from 2006 (beginning of measure implementation) to 2008.

The awareness for the awareness campaign has increased the most, leading us to conclude that it was a successful awareness campaign. The increase in the awareness levels for the bus measures is also very significant. The percentage of the respondents that were aware in 2006 about LEZ was quite high, presumably due its implementation in previous years as part of the CATCH project. Even though the awareness has increased almost by 20% in 2008, the percentage of the people not aware of this measure is the highest.

Table 4.5.1: Awareness of the various SMILE Measures in Suceava

Year	Have you heard of the SMILE project and the following measures implemented as part of the project?	Yes	No
2006	Extension of LEZ in the city centre (6.4)	233 (61.3%)	147 (38.7%)
2008	Extension of LEZ in the city centre (6.4)	308 (81.1%)	72 (18.9%)
2006	Information and awareness raising (11.7)	83 (21.8%)	297 (78.2%)

2008	Information and awareness raising (11.7)	333 (87.6%)	47 (12.4%)
2006	Introduction of the new alternative bus fleet and the stimulating supporting measures (5.6, 8.8 and 8.9)	129 (33.95%)	251 (66.05%)
2008	Introduction of the new alternative bus fleet and the stimulating supporting measures (5.6, 8.8 and 8.9)	313 (82.37%)	67 (17.63%)

Figures 4.5.3 and 4.5.4 illustrate the acceptance levels for the LEZ and the bus measures respectively. For measure 6.4, there is a general shift towards satisfaction, particularly with the existence of the LEZ, showing that the measure is supported. The dissatisfaction can be easily explained by the inconvenience to car drivers from the closure of the LEZ streets. Some of these drivers may understand the benefits, but may find hard to change their driving route and travel time. The acceptance level for the bus measures was in high levels in 2006 and has increased in 2008.

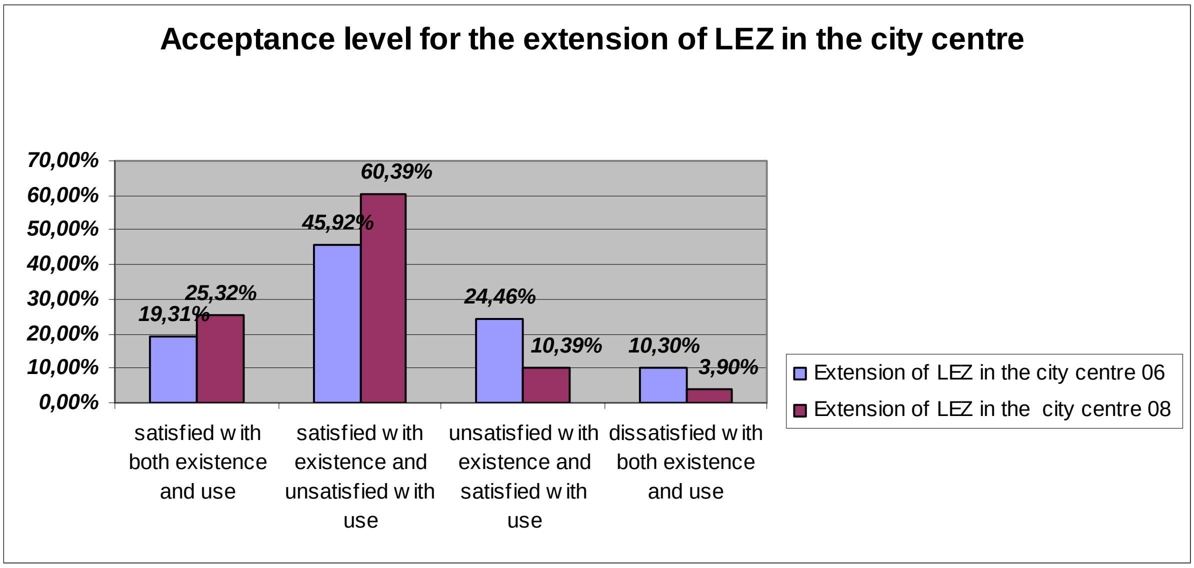


Figure 4.5.3: Acceptance level for measure 6.4e

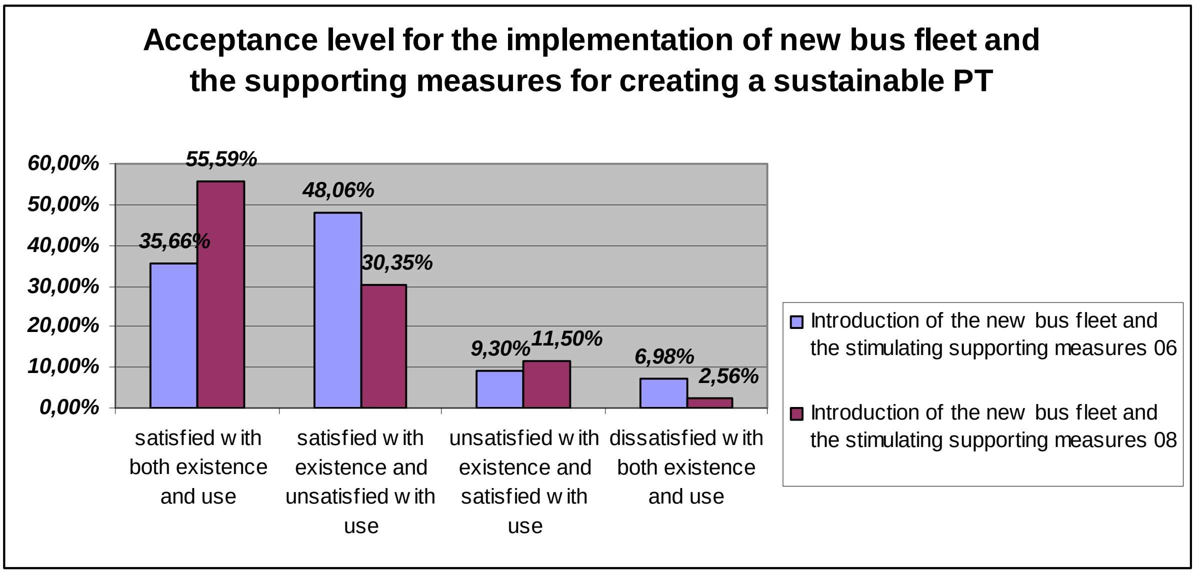


Figure 4.5.4: Acceptance level for measures 5.6, 8.8 and 8.9

4.6 Conclusions

4.6.1 Malmö

In general the measures in Malmö have interacted in a synergistic manner, supporting each other in the goal of progression towards a more sustainable transport system combined with uptake of the available opportunities. Although some antagonistic effects were identified these tended to be minor. This demonstrates a successful planning process, limiting the possibility of such unwanted effects.

Overall, the policy context appears to have been successful in reinforcing the SMILE measures. In part the measures were often selected on the basis of being in line with policy (e.g. STP and TEP). Furthermore, some of the SMILE measures were selected so as to complement the strategic projects in Malmö (e.g. the City Tunnel and the Western Harbour development).

In fact, the completion of the City Rail Tunnel in 2011-2012 will be biggest event concerning transport in Malmö in the near future. The Tunnel will connect the Öresund Link with the old Central Station and the creation of two new centrally-located stations. The City Rail Tunnel will lead to a drastic realignment of public transportation networks and greatly enhanced potential for use of public transportation. This means that during the next 3-4 years the city must actively prepare the public for use of the new services and discourage them away from car usage and mobility management is the only tool for this.

This preparation procedure directly includes elements of the SMILE project. Dialogue, communication, seminars, workshops and travel surveys are methods developed in the SMILE that will continue to be used for target groups. The new target groups, such as companies, the public, shops and retail trade, will be close to the new and improved transport nodes. The initial plan for Measure 8.3 of building indoor parking for cycles near in all three stations will be realised. This will connect closely the public transport network with the cycling network, providing very significant synergies towards sustainable modal shift. Measure 8.1 promoted bus network changes that were aimed at preparing the bus network for integration with the “City Tunnel” stations.

The “bus measures” tie well with City Rail Tunnel preparation context, especially the up-scaling for two of these measures. It would be technically possible to install bus priority system at all intersections in Malmö, expanding Measure 12.7. This will achieve greater bus reliability and subsequently make bus services more attractive. Up-scaling Measure 12.2, namely the Utopia/Spot adaptive traffic signal control once the technical problems have been sorted out, should be beneficial to the Malmö transport network, especially when integrating the changes due to City Rail Tunnel. (There will, however, be no up-scaling until a repeat after-study has been completed and the City of Malmö can confirm the measure has now been implemented successfully.)

The facilities that make Biogas available through the normal gas grid and provide a policy and financial structure for its sale as a renewable product are very important for bio-fuel use, since it is an effort for producing biogas locally and utilising local sources. The availability of such fuel and the corresponding vehicles are a first condition of its use. There is potential for up-scaling here to a more widespread production and use of bio-fuel in Malmö area, with all its positive effects on sustainability.

The expansion of biogas use in car pooling (a start made in Measure 9.1), combined with subsidised parking of clean vehicles (Measure 7.1) will provide added value and could support future moves towards expansion of the scope of the environmental zone to include private cars.

The measures that were implemented in the freight sector were mixed in their impact. Where they involved improving the energy and environmental efficiency of existing operational structures then there were striking benefits, through eco-driving training, deployment of biogas vehicles and the use of in-cab telematics to support the eco-driving training. However, when it came to making changes to the way in which transport movements were organised the results were minimal. This shows how difficult it can be to make changes to the way in which systems are organised, particularly when it is reliant on groups of individuals or companies to work together in the context where there is a perceived risk to their business.

Overall the trend in the modal split data that is presented in figure 4.1.4 is promising and suggests that there is a move towards more sustainable means of travel in Malmö. This trend is backed up by the changes observed in the larger 5-yearly travel survey of over 5000 people which showed the following changes between 2003 and 2008 (although the different scope of the surveys mean that the detailed figures differ slightly).

	2003		2008
Car	53%	→	41%
Bus	10%	→	9%
Train	3%	→	5%
Cycle	20%	→	23%
Walking	14%	→	20%

However, the data also show that there is much work on this issue that remains to be done, and indeed bringing about further change will become increasingly difficult because change will need to be induced from people who are more resistant to making these changes.

It seems fair that SMILE can claim to have contributed significantly to these changes, although it needs to be recognised that other activities will also have been occurring in Malmö during this period. The other activities are, however, directly linked to the SMILE objectives because of the strong policy links that are in place to deliver the wider strategy. What does not come across solely from the modal split data is the impact of the project on the emissions that result from the transport use and it would be expected that the emissions of both greenhouse gases (primarily CO_2) and local pollutants (NOx, particulate etc) per kilometre travelled will have dropped.

The final data element to which there has been no access for the SMILE team is the total amount of travel occurring within the Malmö area. This is relevant because if the population is increasing and the economy is prospering then it is possible that total vehicle kilometres travelled will be increasing at such a rate that the impacts of beneficial modal shifts and reductions in specific emissions rates will be cancelled out by the overall mobility trend.

4.6.2 Norwich

The Norwich chapter demonstrated how measures interacted to increase the effects on a variety of indicators. In general the policy context reinforced the SMILE measures, in part because the measures were often selected on the basis that they were in line with policy. The measures were in practice one aspect of policy implementation; e.g. the Rail Interchange (8.4) helped achieve the NATS policy objective of securing Norwich’s position as a regional and strategic interchange centre. The freight measures were designed in line with the policy objective of reducing traffic coming into the city centre and will be supported by the development of a Northern Distributor Road.

There were aspects of some of the measures which could have negative outcomes. For example, care should be taken in monitoring whether the car share measure (11.4) has any negative effects on viability of rural bus services or in reducing local walking or cycling trips. Although increased bus usage, a common aim of several measures, is undoubtedly a positive outcome, there may be localised pollution effects. The extension of measures such as the Low Emission Zone (6.2) may be a means of combating localised problems. Several measures had a positive impact on cycling, although cycling was not stated as a major focus at the outset of the project in Norwich. Measure 11.5 (Individual Travel Advice) and 11.3 (Travel Planning) included initiatives which successfully increased cycling. The freight measures should reduce overall numbers of freight vehicles travelling in the city, but the use of bus priority lanes in measure 10.4 has proved controversial and cycle groups continue express fears over safety.

Measures reinforced each other across a range of sustainable transport objectives. These included effects on climate change, atmospheric pollution, health and quality of life. Effects were localized in some cases, as in the LEZ (6.2) and in other cases such as car sharing (11.4) their impact was diffuse across large parts of the city and beyond. A number of the measures such as travel planning (11.3) and Goods Delivery to Park and Ride (10.6) were initiatives which were at the forefront of UK policy implementation and have acted as exemplars for other areas and national guidance to follow. The Clean Fuel measure (5.4) advanced knowledge which has national and international significance.

To some extent, the individual measures either had very localised impact or were at a demonstration stage and their impact will only be significant if the measure is upscaled considerably. This had impacts on the way that the data were collected, meaning that attempts to use a standardised data collection format were not always successful. A more flexible approach, with a range of localised and city wide measurement depending on the circumstances and a technical and value for money assessment of the most appropriate method could have helped. This would help both in tracking the cumulative effects and in providing evidence of progress in relation to meeting national targets. With hindsight, a systematic approach to data needs could have been taken which considered the data needs of all of the measures and data collection could have been put in place at the appropriate scales.

These data and methodological considerations have influenced the form this overall assessment has taken. They do not, however, undermine the ability to undertake such an assessment. In Norwich, the main cumulative effects were qualitative in that the most influential changes will be to behaviour of individuals and organisations.

This report has demonstrated that the SMILE measures have had an impact on sustainable transport in Norwich. The impact of individual measures has been extremely varied, as would be expected from an experimental set of measures with a range of scales, topics and approaches. The impact of some measures, such as travel planning, has been significant and also offers the prospect for further growth. Overall, quantitative results will become more relevant if the measures are upscaled but qualitative assessment will remain crucial.

There are some key findings and pathways forward that will be exploited locally. The research findings regarding the optimum blend of biodiesel that balances the global and local issues of pollution and sustainability provides a clear and immediate pathway for local implementation, although it is in direct conflict with the current national fiscal regime for bus operation in the UK. The use of waste oil for biodiesel production as a way to address sustainability concerns, together with experiences of Malmö in producing biogas from some of its waste streams has led to considerable local interest in following a medium term strategy to develop and promote biogas within the local contracted transport market in Norwich.

The focus on cumulative effects has shown that there are a number of pathways through which the measures are mutually reinforcing. Individual measure results highlight opportunities for increasing their impact. This will require continuing support from the public sector, private sector or both in a timescale which goes well beyond the SMILE programme. This has been recognised by those involved in the implementation through their attempts to ensure that the measures have a life after SMILE.

The cumulative effects of the various measures may help in the growth and upscaling of measures; as has been discussed, increased use of LEZ measures may be an incentive for greater use of freight consolidation and priority access. As markets for services increase as expected, their impact across a range of indicators will become greater. Particular synergies can be expected to increase; success of the Shop & Go facility will be enhanced by a high quality, efficient bus service. Across the measures, similar, mutually reinforcing relationships exist. Most strikingly, the travel plan philosophy has the potential to permeate institutions such as the local authorities and to inform policy development in future. Travel planning can also be tool through which sustainable initiatives relating to public transport, car sharing, walking and cycling can be promoted.

4.6.3 Tallinn

The impact of the public transport measures has not been as clear as hoped, although it has helped to change the image of public transport. The conclusion is that a wider range of initiatives is required to simultaneously impact upon several elements of the transport system in order to drive a wider sustainable change, to include travel awareness and campaign measures in order to make best use of the investments that are made.

Hence, the most important result for Tallinn from participation in the SMILE project is the focus that it has provided on the importance of public transport in the city through the linkage of external funding to the project implementation. Apart from the actual results and impacts of the measures themselves, which are documented elsewhere in this report, this is emphasised by the increased list of sustainable transport projects scheduled for implementation in Tallinn and the future participation in the CIVITAS MIMOSA project.

Achieving this ongoing commitment required a detailed examination of the political and financial implications. Whilst such an examination might be seen as prevarication, it can also be seen as an important step to ensure that the full implications of a four year project are understood and accepted in order not to risk further problems later, particularly as the municipality is reported to have only a two year financial plan. This can to a certain degree be balanced by the expectation of long term stability both in terms of political control and also of low staff turnover within the relevant departments of the municipality.

There are other projects in the city that also work synergistically with the two SMILE measures. A tram upgrade project started two months before SMILE project and is in operation, overall improving the image and quality of PT services and working supplementary to the SMILE measures. Given the geographical characteristics, the Park and ride service, adds to the mixture of public measures in Tallinn and is particularly supported by the public transport priority measure. It was also noted in interviews with project staff that an underground rail network could alleviate much of the transport problem in Tallinn, showing the new-found level of ambition in the city, but unfortunately the soil is not appropriate (sand and clay) for constructing one.

The effect of increases in fuel prices during 2008 along with the cost of parking in the centre have worked synergistically with SMILE measures, providing an opportunity for PT modes to be cost competitive in comparison to car travel. This combination may not only a temporary effect that increases the cost of car travel and gets people to use PT. It can strongly contribute to the perception that PT is an acceptable and economic alternative to private cars.

4.6.4 Potenza

The conclusions in relation to the Potenza demonstration clearly relate to the difficulties that can result if there is a lack of stability in the stakeholder framework that is needed to develop and implement transport policies and strategies.

The transport strategy was refreshed in the period immediately prior to the start of SMILE and this had led to an uneasy relationship between the local authority and the contracted public transport provider – a relationship which ultimately broke down around 12 months into the SMILE contract period and led to a period of around 12 months instability before a replacement public transport provider was formally introduced to the project team. This also had repercussions to the specification of some of the measures particularly the DRT service, for which the original plans had been based on the in-house knowledge of the original public transport provider.

The time taken to rectify these issues is not uncommon, and is a fact of life in many political contexts. However, when dealing with a fixed term contract this length of delay inevitably means that timescales for implementation are compressed and evaluation is less satisfactory than would otherwise be the case.

Nonetheless, the process of setting up these measures has been useful and, given the effort that has been invested to make them happen after the changes in partners, it is anticipated that the support will now be in place to drive them forward over the next few years. And having the four CNG buses operating in the city provides a visible legacy of the project.

There is also the potential for further learning and uptake of measures from the other SMILE cities, particularly in the area of mobility management and promotion of sustainable travel, where the positive experiences of Malmö and Norwich should provide confidence and ideas to the local mobility managers as they perform their roles in future. On the technical side the presence of 4 CNG buses also provides the springboard for an investigation of the potential to use biogas as a fuel rather than compressed natural gas in order to capture life cycle greenhouse gas savings. However, it is likely that a market demand greater than that provided by 4 buses would be needed in order to driver the necessary infrastructure investment.

4.6.5 Suceava

The six transport measures applied in Suceava as parts of the SMILE project were deemed successful overall. The vast majority of the goals that were set during the initial phases of the projects were achieved in full.

The SMILE funding has accelerated the progress with which Suceava has been able to improve public transport service quality. Provision has moved away from trolleybuses, pre-Euro buses and mini-buses, which covered most of the urban public transport needs, to a system mainly based on Euro 3 and LPG buses; 30 of which were provided and 15 upgraded to use LPG through SMILE. A particular driver in the successful implementation of the bus measures has been the linkage of external funding (i.e. from the EC through SMILE) to the achievement of the implementation deadlines set. SMILE has, through the investment in new buses, helped to raise the standard and change the image of public transport. The promotion of LPG through fuelling converted buses, also adds to the image of an innovative transit system.

The measure 6.4 set the base for the continuation of extension of LEZ in the city centre. The new buses, of which 15 run on LPG fuel, are crossing the city centre on a new set of Eco-routes, replacing the old buses on the historic routes. This aspect has a good environmental impact on the level of emissions in the city centre whilst making a showcase of the new public transport system. The environmental effect from the combined measures seems to be greater than the sum of its parts and increasing through time. It is also demonstrated to the local population and shop owners (professionals) in the city centre that development and economic prosperity are possible without pollution and cars everywhere.

One of the direct aims for the measures was raising awareness and changing the perception for public transport, along with the demands for quality of service. When this awareness and behaviour change crystallises, it can be manifested, among other things, as pressure from the public to the politicians. This is an added cumulative effect that can result to increasing sustainable transport policies and all the results (environmental, social and economic) that stem from that. Improvement of public transport information (measure 8.9) and the special bus services and facilities for elderly and disabled people (measure 8.8) help access to public transport by people, who in the past would have been unable to use it. The public transport company and the organisation of the routes remain in the control of the municipality and has a strong social aspect. The reorganised service includes more early morning and late evening services on the core network and a fare structure that for the first time which can offer discounts for elderly people and students. The mobility and quality of life for these people has increased through these measures and contributes towards social equality.

With respect to the institutional background, all the decisions about transport are taken by the local city council. The Major of Suceava (head of the Municipality) is of key importance in this process. Hence, the importance of "political will" for implementing sustainable transport measures is stressed here and this is a relevant factor to whichever context such measures are implemented. It was noted by the interviewees that a city council decision helped the implementation of SMILE measures, by purchasing 15 extra buses. This was an example of the political will to implement sustainable measures that have been proved to work, as demonstrated by SMILE project. Some of the positive effects were obvious whilst others are indirect, for example the increased transport and environmental sensibility, gained through the experience, which can lead to positive policies in the future.

There is potential to continue to run promotional campaign for clean vehicles and fuels as technological developments occur leading to further public and private sector take up. This could build on the promising results in respect of running costs which should prove a strong influencing factor.

Potential exists to further convert the remainder of the public transport fleet to LPG, with further emissions benefits. The total current PT fleet is 36 vehicles, with the 6 vehicles not included in the current programme mainly operating on infrequent routes outside the city. Clearly there is potential to replace these vehicles from a technical perspective, but because they operate mainly outside the city the priority is to direct the investment at other needs within the city area.

There is some, limited scope for the further extension of the LEZ, both within the city centre and also to smaller suburban centres. However, in comparison with what has been achieved to date, these extensions would have minor impact.

There are no special factors that would make these measures only applicable to Suceava and not readily transferable to any other city in Romania or EU. The interviewees indicated that they are in contact with other Romanian municipalities, providing their experience to other who pursuit similar EU projects.

4.6.6 Transnational Issues

Through time, changes in attitudes in organisations and amongst individuals can have significant impact on choices. SMILE measures have encouraged these attitudinal changes within the institutions in all the SMILE cities by helping to inform and reinforce the transport policies and provide evidence of their effects. There are also instances of sharing expertise across the SMILE cities. Through measure 5.4, Norwich has been a leader in the UK in developing understanding of clean fuel issues. However, scientists from UEA have been able to go further and use links with Malmö to stimulate further research beyond the original remit of the SMILE clean fuel trial in Norwich.

There are striking similarities between Malmö and Norwich in the growth of travel planning and other soft measures within the local authorities. The context has been different in the two cities with, for example, more experience of cycling in Malmo. In Norwich, the degree to which council staff members have engaged with businesses and schools, developing innovative initiatives and encouraging organisations to take ownership of the plans has been striking.

In both Malmö and Norwich there are real opportunities for institutional learning achieved through SMILE to feed into policy development. However, care should be taken not to lose sight of the existing knowledge and expertise in 'hard' areas such as engineering and infrastructure. In Malmö, there was one instance where not fully involving technical experts in setting up a measure meant that innovation (in relation to automated intersection technology) was not as advanced as it might otherwise have been. In Norwich there is a recognition that soft measures may need to be backed up by infrastructure improvements, e.g. in creating safe routes around schools. The Tallinn CEA report highlights that although there were only two SMILE measures in the city, there were specific links with Malmö in certain areas. It is also clear that a number of new transport initiatives within Tallinn have been stimulated by involvement in SMILE. Continuing links amongst the cities in both technological areas and fostering institutional learning and engagement in soft measures and policy development would be useful outcomes of the SMILE programme.

The main transnational issues are the regional and national differences that are apparent in cultural, governance, taxation and technology perspectives which influence the situation in the partner cities. These aspects have a significant influence on what has been demonstrated as part of SMILE and more importantly how the results can be effectively transferred to other countries around Europe. SMILE has identified some specific examples of this type of issue, for example:

- It appears to be accepted practice in Italy for demand responsive transport services to be granted local subsidy to ensure provision of inclusive public transport to the remote parts of the regions. This comes at a significant cost (the estimate in Potenza was annual operating costs of around €100,000), which would be seen as difficult to justify in other locations where there are different public expectations and demands on local authority budgets.
- One of the most promising measures in Malmö has been the deployment of biomethane infrastructure for refuelling vehicles either directly or via use of the gas grid as a transfer means. However, this is dependent upon the level of financial support for this renewable fuel according to the national fiscal regime, and certainly in the UK this measure would not have been treated in a comparable manner had it been implemented in Norwich during the SMILE contract period. There are also issues around the availability of gas vehicles in different countries which would also impact upon the transfer potential of this measure.
- The third and final example given here relates to the degree of transport policy development and background data which varies considerably between the lead partners (Malmo and Norwich) on one hand and the SMILE partners based in the new member states on the other, namely Tallinn and Suceava. One key element of SMILE is transfer of knowledge from lead partners to follower cities. However this is primarily at the level of measure and policy development. Issues related to expertise in monitoring and the integral nature of traffic and economic modelling that lie between these two extremes are actually very important to help inform policies and lead to relevant strategy development. This needs to be recognised as a potential issue that needs to be addressed to facilitate the speedy development of a sustainable transport system in the new member states in order to avoid an inevitable move to a car-based society.

There are also issues of conformity of approach, for example in the specification of the environmental terms that apply to Low Emission Zones and whether there needs to be a common approach within countries or across the EU.

5 Technical Evaluation Assessment

This chapter draws together the results of the measures within each technical workpackage across all five sites and investigates the similarities and differences in results between them. This includes brief reference to each measure's impact evaluation, process evaluation, upscaling potential, cost effectiveness, transferability assessment in order to draw out common themes and differences between the measures in each workpackage.

5.1 WP5: Clean Vehicles and Fuels

Energy-efficient, cost-effective and clean vehicle fleets and the necessary energy infrastructure.	5.1 Clean municipal fleet	Malmö
	5.2 Biogas on the net	Malmö
	5.3 Clean heavy vehicles with CO_2 cooler	Malmö
	5.4 Alternative fuel vehicle fleets	Norwich
	5.5 Introduce clean vehicles in a large fleet of urban buses	Potenza
	5.6 Alternative fuel bus fleet	Suceava
	5.7 Promotion of alternative fuels in the public and private sector	Suceava
	5.8 Environmentally adopted cars	Malmö

Impact and Process

From a budget perspective, the measures that involved investment in clean vehicles and fuels were some of the most costly measures within SMILE. As such there was great expectation on these measures to contribute significantly to the overall objectives of the project.

There has been a mix of approaches within this workpackage, with direct investment in new vehicles, promotion of clean vehicles and fuels to private individuals and businesses, similar promotion within two public institutions for marginal increases in investment in vehicles and also work to upgrade the fuel supply chains for two types of biofuel through fundamental research and development of the supply infrastructure. All these activities have their place within the development of a broad-based transport energy supply and use system and so this workpackage presents a valuable collection of the necessary investments.

Starting with the measures that lie furthest upstream in the energy supply chain, the two measures that involved research and development of the supply infrastructure were:

- Measure 5.2 which involved three linked investments in biogas processing and refuelling infrastructure for transport applications, and
- Measure 5.4 which involved implementing a supply chain for sustainable biodiesel in Norwich.

In both cases the measure involved subsequent use of the fuel supplied in existing vehicles (i.e. no investment in new vehicles as part of the measure, although there was investment in biogas vehicles as part of the other related measures in Malmo).

The investment in biogas supply in Malmö (measure 5.2) has involved three linked technical approaches to the issue of biogas supply. The first to be implemented involved using road-based tankers to transport the upgraded biomethane from Malmö, where the fuel processing took place to a location around 60km south east where there was gas refuelling infrastructure, but which had never previously received biogas. This approach was taken to broaden the spread of biogas availability in the region while the other activities were undertaken in Malmö.

The second stage involved the installation of a gas upgrade facility at the main sewage water treatment plant in Malmö to be linked with a gas grid injection system. This has allowed biomethane to be injected into the grid at the point of production and equal amounts to be drawn from the grid at vehicle filling stations, so that private drivers and vehicle fleet operators have the opportunity to purchase the environmentally friendly fuel. This provides efficiency savings compared to the use of tankers to transport the upgraded fuel to a remote location.

The final investment as part of SMILE was the installation of a slow filling station linked to the gas grid at an industrial location where it is known that there are a lot of fleet vehicles based. This investment happened towards the end of the project and so the demand for the gas is still being developed.

It is interesting to note that the product is being marketed in various parts of Sweden as “vehicle gas” consisting of approximately 50% biogas and 50% natural gas. The reasons for this decision undoubtedly varied from place to place in Sweden. One reason was concern that demand for pure biogas might outpace supplies. In other places there was a concern that demand for pure biogas might be too weak to recoup investment costs in biogas production. Therefore production and supply of “vehicle gas” would be easier to achieve and be a less risky way to introduce greater amounts of non-fossil methane into the transport sector. The exact mechanics of this innovation lie partly within SMILE and partly outside SMILE and did not originate exclusively from the SMILE application process.

This process has involved not only significant financial investment but also extensive negotiation with those involved in the operation of the existing gas grid in Sweden from both regulatory and technical compatibility perspectives to enable this project to happen. The sums involved in the investments are such that the installation must be viewed as a long term investment so that the costs can be recouped through sales of vehicle gas. The price at which the vehicle gas is sold is considerably cheaper than petrol or diesel, which means that there is a direct financial incentive for the vehicle operators to change to this fuel from petrol or diesel, although this decision must also be viewed as a long term commitment, as there is an additional purchase cost to be paid for the vehicles that can use this fuel.

At the start of SMILE measure 5.4 in Norwich, which involved the use of biodiesel in various fleets, was expected to be relatively straightforward to implement. It was intended that the fuel used would be sourced from an SME enterprise that was a partner in the project. However, this company went out of business at an early stage of the project following problems with the quality of the fuel that it was supplying. This coincided with the increase in concerns about the sustainability of biodiesel at a global scale as a transport fuel. As a result, the measure was completely redefined to investigate the practicality of establishing a sustainable, high quality supply chain for biodiesel in the UK. The research process took around two years and resulted in such a supply chain being established and the end use in various vehicles being tested to establish the optimal balance between operational requirements, greenhouse gas reductions and local pollutant emissions.

In many ways this research process should be a one off exercise, as long as the findings can be shared widely, because the process that has been established should be transferable to other locations, providing the source oil from sustainable sources such as used cooking oil other by-products and the local fuel distributors are willing to participate in the process. The amount of appropriate raw material is likely to be the key limiting factor in replicating this measure, as it is a limited resource, and the law of supply and demand in the open market will determine the degree to which this will be adopted more widely.

A key element in the wider uptake of both measures will be financial considerations on the part of the end user. The production cost of both biofuels will depend on fixed costs associated with equipment and processing and variable costs associated with the input materials. However, the market price to the end user depends upon the degree of financial incentive that is in place in each local market. There are wide variations between countries in this respect and whereas, for example biomethane is an extremely commercially attractive transport fuel in Sweden, the opposite is currently true in the UK. The final consideration linked to this is the fact that these biofuels are in direct competition with conventional fuels and the price of petrol and diesel has been fluctuating significantly on the world market in the past 2 years, meaning that planning in the open market becomes very difficult from a business perspective. What would be needed to help would be for large end user organisations to commit to long term, fixed price contracts in order to guarantee an element of stability in the investment.

The biogas projects in Malmö have been shown to be extremely beneficial from an overall cost effectiveness perspective, because in the long term they show both a cost saving and a reduction in CO_2 emissions. Hence it is the size of the financing required, the certainty of the business planning and the regulatory and technical issues that present the real barriers.

Five measures have involved purchase of new clean vehicles in a range of different contexts.

Measure 5.3 involved the purchase of gas-powered heavy goods vehicles that have been operated using vehicles gas (50% biogas / 50% CNG) in Malmö. The measure has proved to be successful in both operational and long term financial terms. The involvement of the private sector dairy company in the project has undoubtedly been helped by funding from the European Commission through CIVITAS SMILE as this has helped to offset the extra cost of investing in the vehicles, which is a significant barrier to them because of the effects on their cash flow. However, even in this case, the dairy company queries why they should carry the majority of the extra financial investment when environmental benefits will be incurred by the wider community. This raises the wider question of the balance between private and public sector investments that will bring environmental benefits that accrue to the wider population, which is a common question raised in terms of making environmental investments. In the case of this measure in Malmö there is a long term financial benefit to the operator, which would mean that the investment may have happened anyway at a slower rate, but in other locations where the fiscal regime supporting the fuel price is less favourable, this investment would probably not happen even with EC support for the vehicle purchases.

Measures 5.5 and 5.6 have both involved investment in alternatively fuelled buses. Measure 5.5 saw an investment in four CNG minibuses that were purchased as part of a formal tender direct from the manufacturer. These buses are typical of the vehicles that are sued to provide the public transport services in the small and hilly town of Potenza, but are not typical for many other parts of Europe.

Measure 5.6 involved the purchase of an initial batch of 15 Euro 3 diesel buses that were subsequently converted to LPG and evaluated as such, followed by the purchase of a subsequent set of 15 more Euro 3 diesel buses to go through the same process.

The investment in the 4 CNG minibuses represents a small proportion of the total number of buses providing the public transport services in Potenza, whereas the 30 vehicles purchased in Suceava is a complete replacement of the vehicles that are operating the bus services within the urban area, leaving only six older buses that operate on services from outside the urban area into the town. The scale of the investment in Potenza is more typical of the fleet replacement that occurs in bus fleets, where a small proportion are replaced during each year or two year period. It is extremely unusual for any organisation to be able to replace such a large proportion of the vehicles as happened in Suceava, which is combination of a recognition of previous underinvestment in the bus fleet with a strong political control through the city's mayor.

In operational terms it is too early to state if the investment in the CNG buses in Potenza has been a success because measure implementation was heavily delayed. However, they expect fuel costs to be reduced due to a favourable taxation regime in Italy.

The situation in Suceava is complicated by a complete reorganisation of the transport provision in the city, with increased regulation of private transport services. When taken together, the new vehicles and the service reorganisation have been a real success in comparison to the previous situation.

The final two measures which involved project partners in the purchase of ‘clean vehicles’ involved a range of public institutions in Malmö agreeing to implement a policy position to try to purchase ‘clean’ rather than conventionally fuelled vehicles wherever possible. The organisations involved were the City of Malmö and UMAS - the University Hospital, Malmö General Hospital. In both organisations there was, at least in theory, a form or priority or investment in clean vehicles prior to SMILE. In 2004 (i.e. prior to the start of SMILE) approximately 33% of municipally owned or leased vehicles in the City of Malmö could be considered “clean”. Five years previously the figure was 25%. UMAS is one of the hospitals owned and operated by the regional health authority which is part of the regional authority called Region Skåne. The regional authority has a car procurement policy that places great emphasis on clean cars. As a part of Region Skåne, UMAS was supposed to follow this policy. These policies had been working to some extent prior to SMILE, as witnessed by the existence of the 33% clean vehicles in the City of Malmö fleet prior to the start of SMILE although it seemed that central policies regarding purchase of clean vehicles were being circumvented by middle-level managers. At UMAS their in-house transportation department should have been able to “suggest” clean vehicles in relation to the specifications as expressed by the clinics and/or specific end-users, although in practice this had not always been possible for some of the specialist vehicles required.

During SMILE it would appear that ignorance of the clean vehicle purchase policies or deliberate intransigence at the City of Malmö declined significantly. It is difficult to prove a direct causal link to SMILE, but it seems likely that this is due to the project intervention, particularly during the period Spring 2006 – Autumn 2008 when two successive measure leaders worked actively with this measure. The percentage of cars procured by VISAB, a City-owned company that buys or leases vehicles for the City, that conformed to the intentions of this measure and City policy ambitions rose substantially. The outcome was that by the end of SMILE 65% of all City of Malmö cars, vans, mini-buses and light trucks can be considered clean on the City’s own definition. This is an impressive result, although it falls short of their original objective of a completely clean fleet.

The situation at UMAS was complicated during the course of the project by a reorganisation, which saw the number of vehicles under the control of UMAS within the overall regional organisation reduced and the in-house transport department removed from UMAS control. The result was a more distant relationship between the transportation department and the end users. Originally there were 65 cars at UMAS, but because of the reorganisation only approximately 50 vehicles can be considered no to be remaining at UMAS by the end of the project . 21 cars were replaced with clean vehicles during the duration of the measure and 4 cars were replaced with non-clean cars. Of all 50 vehicles the replacement amounted to approximately 42%. Among replaced cars 84% were clean.

The marginal costs of replacing with clean vehicles in the same class were relatively low, which suggests that and information programme and active policy implementation can have a significant effect on uptake. This is based on the assumption that the vehicles and necessary refuelling infrastructure are actually available in the locality. The light vehicles in question in Malmö are largely flex fuel petrol / ethanol cars, with some CNG / petrol versions. Availability of these vehicles and fuels cannot currently be taken for granted in other parts of Europe.

The final measure has been at a more promotional level, although the end effect has been for independent vehicle operators (predominantly fleets and vehicles operated commercially such as taxis) in Suceava to purchase LPG vehicles.

The premise behind this measure is the policy of the local municipality to promote the use of LPG as an alternative to petrol and diesel and then the niche use of biogas in some fleets in the longer term. The municipality has led the process through use of LPG in a demonstration vehicle within its own fleet and the conversion of the newly acquired buses to LPG. They have also actively encouraged local fuelling stations to sell LPG as well as conventional petrol and diesel fuels through engagement and promotion activities and the planning process.

The information campaign that has been conducted has largely been based on the financial benefits to commercial vehicle operators from the use of LPG and this direct financial benefit has proved to be a successful lever in the market.

Cost Effectiveness

The cost effectiveness values in Table 5.1.1 suggest that the measures related to biogas offer the best way forward of the measures from workpackage 5 from a cost effectiveness perspective. However, as noted previously in the text, the investment costs are significant and the measure needs to be viewed over the long term, as will be shown in Table 5.1.2.

Table 5.1.1: Cost Effectiveness Summary of the Measures in Workpackage 5

Measure	CO_2	NOx	PM_{10}
5.1 Clean municipal fleet	€579 - 1775 / tonne CO_2	€4,400 – 5,800 / kg	€93,300 – 100,000 / kg
5.2 Biogas on the net	-€68 / tonne CO_2 (overall) €11.8 / tonne CO_2 (Ystad) -€134.3 / tonne CO_2 (Depa) -€75.5 / tonne CO_2 (Sjölunda)	Not assessed	Not assessed
5.3 Clean heavy vehicles with CO_2 cooler	-€270 / tonne CO_2	-€57.9 / kg	-€3185 / kg
5.4 Alternative fuel vehicle fleets	€50 - €63 / tonne CO_2	Not assessed	Not assessed
5.5 Introduce clean vehicles in a large fleet of urban buses	€190.5 / tonne CO_2^	-€1.95 / kg	-€121.9 / kg
5.6 Alternative fuel bus fleet	€274.6 / tonne CO_2	€16.5 / kg	€263.9 / kg
5.7 Promotion of alternative fuels in the public and private sector	€31.5 / tonne CO_2	€43.7 / kg	€45.0 / kg
5.8 Environmentally adopted cars	€24.6 / tonne CO_2	€133.7 / kg	€9406 / kg

^ For measure 5.5 the cost effectiveness value is positive as a result of a calculation where a reduction in annualised cost is associated with a worsening in CO_2 emissions.

Of the other measures, the investment in new vehicles give a range of values that reflect the additional effort and capital investment required to bring about the measure and associated impacts. Measure 5.8 appears to present a relatively cost effective way forward. This is due to the relative ease that was found in sourcing clean vehicles, equivalent to the conventional equivalent, on the open market. This made it relatively easy to implement measure 5.8 in UMAS. This result is in contrast to measure 5.1 which involved a similar process within the City of Malmö. It appears that a lot more effort was required on the part of the measure leader to embed clean vehicle procurement within the processes of the numerous departments of the city authority. The high distance driven by the cars and vans in the UMAS fleet also contributed by increasing the impact of the measure compared to measure 5.1.

The promotion of LPG as a fuel for commercially operated vehicles in Suceava has also shown relatively positive cost effectiveness values. This is based on the costs incurred by the municipality in the promotion work carried out and does not include the financial benefits to the vehicle owners / operators, so a fuller analysis of this measure could actually be even more positive in that context.

Table 5.1.2: Indicative Absolute Values of Cost and Impact for the Measures in Workpackage 5

	Total Cost (Investment and operation)	Net Cost (After revenue / reduced operating costs)	Period	Annualised net cost	Comments	Impacts		
						CO_2 reduction	NOx reduction	PM_{10} reduction
5.1 Clean municipal fleet	€839,783	€839,783	4 years	€139,964	This figure reflects significant staff cost involved in internal project development, marketing and administration	92.8 – 241.8 tonnes per annum	24 – 32 kg per annum	1.4 – 1.5 kg per annum
5.2 Biogas on the net	€33,946,593	-€1,374,097	18 years	-€76,339	This measure shows a net revenue (i.e. negative cost) over the full life of the project, but a significant investment and long term commitment compared to the other measures.	431 tonnes in 2008 Increasing to 1121 tonnes per annum at full capacity	Not assessed	Not assessed
5.3 Clean heavy vehicles with CO_2 cooler	€942,062	-€663,230	9 years	-€73,692	Costs cover the 9 year life of a heavy goods vehicle and take account of additional cost of gas vehicle and fuel cost savings to the operator in comparison to diesel HGV operation.	273 tonnes per annum	1273 kg per annum	23.1 kg per annum
5.4 Alternative fuel vehicle fleets			Annual	€30,000 - €37,500	Measure 5.4 effectively turned into a research study and the costs quoted here relate solely to the application of the transferable knowledge gained in using sustainable biodiesel within a mid-sized UK bus fleet.	600 tonnes per annum	Not assessed	Not assessed
5.5 Introduce clean vehicles in a large fleet of urban buses	€134,144	-€84,459	11 years	-€7,678	Impacts are based on a desk-based study of expected operation using manufacturer's data over an 11 year life for a minibus of this type.	40.3 tonnes per annum ***increase***	3933 kg per annum	63 kg per annum

	Total Cost (Investment and operation)	Net Cost (After revenue / reduced operating costs)	Period	Annualised net cost	Comments	Impacts		
						CO_2 reduction	NOx reduction	PM_{10} reduction
5.6 Alternative fuel bus fleet	€1,529,475	€1,529,475	15 years	€101,965	Annualised cost represents the additional cost of renewing and converting to the LPG bus fleet compared with standard diesel equivalent, annualised over the 15 year life of a bus. The size of the NOx and PM_{10} reductions are as much a comment on the poor state of the buses prior to the measure (old technology that was poorly maintained) as it is on the scale of the renewal within a single fleet.	371 tonnes per annum	6163 kg per annum	386 kg per annum
5.7 Promotion of alternative fuels in the public and private sector	€68,104	€68,104	6 years	€11,351	The costs quoted for this measure relate solely to the costs incurred by the local authority in setting up and running the promotional activities. The costs associated with purchase and operation of the LPG vehicles by a diverse group of small and large vehicle operators are not included. However, it should be noted that if these costs presented a barrier than it is extremely unlikely that any change and hence impact of the measure would have occurred.	360 tonnes per annum	260 kg per annum	252 kg per annum

	Total Cost (Investment and operation)	**Net Cost (After revenue / reduced operating costs)**	**Period**	**Annualised net cost**	**Comments**	**Impacts**		
						CO_2 reduction	**NOx reduction**	**PM_{10} reduction**
5.8 Environmentally adopted cars	€8,466	€8,466	3 years	€2,822	The low cost of the measure reflects that the extra input of staff was low, because it involved staff in the UMAS / Skane transport department going about their normal functions and finding equivalent 'clean' vehicles available at marginal price differences. These vehicles are then used heavily – up to 60,000 km per year, which maximises the impact of the measure over the three year lease period associated with a typical UMAS vehicle.	115 tonnes per annum	21.1 kg per annum	0.3 kg per annum

The size of the impacts is clearly generally significant and beneficial. Form a CO_2 perspective, the only negative impact is the increase in CO_2 emissions linked to the CNG buses in Potenza. This is countered both by an ongoing reduction in fuel cost and a significant reduction in local pollutants, which highlights the need to understand the motivation behind the introduction of the measure.

The biggest single impact of the measures in through the massive investment in biogas infrastructure in Malmö, although, as already stated, this required a significant initial investment for the resulting benefit to be obtained. The other measures generally emphasise the greater opportunity that exists when interacting with heavy vehicles (HGVs and buses) and high mileage vehicles, particular those operated commercially, such as taxis and the UMAS dedicated fleet.

The data also provides an opportunity to show how the measures can link together – how there is a need to provide renewable fuel infrastructure and then suitable vehicles in order to capture the benefits. In particular, measure 5.3 would not be possible without the investments made in measure 5.2. This provides guidance for Potenza, because the CNG buses could show a significant life-cycle CO_2 reduction if they are able to make the investment in biogas generation and clean up technology.

Upscaling

The measures in workpackage 5 have actually been implemented at quite a significant scale in relation to their potential within partner cities. This is in part because this type of measure often requires investment both on its own part and also in support infrastructure which brings economies of scale. For example, installing a refuelling tank to run one bus on an alternative fuel makes little sense. The issue of scale of investment is best shown by the nature of the biogas infrastructure in Malmö, where the long term nature of the project means that a wholehearted effort is needed to support the investment that is made.

Investment costs could represent a barrier to upscaling, in that the institutions responsible for purchasing the vehicles are likely to have a limited budget for vehicle replacement each year. This can be seen in action in measure 5.3, where the dairy company was only able to invest in the vehicles at a rate of around 4 per year, even with SMILE co-financing being present to help the process.

Another barrier will be the availability of the alternative clean fuels. LPG is being promoted in Romania, but LPG is in effect a useful by product from the petrochemical industry and has limited supply at global level. Limitations exist on other fuels, particularly the sustainable biodiesel used in Norwich and biogas, as both these options are dependent upon specific feedstocks as an input to the process.

The overall impact of this process in the future is that in the medium to long term the dominance of a particular type of fuel for transport applications may be replaced by a broader spectrum of fuels with different characteristics and suited to different applications.

Transferability

From a technical perspective most of the work conducted in workpackage 5 is directly transferable to other locations.

The barriers to transferability of clean vehicles and fuels are more closely related to the financial issues of investment costs and the fiscal regime which has tended to promote different options in different countries, as the market reacts to the different stimuli that are in place. An example of this is the focus on LPG in Romania, where the fuel is favoured at a national level as a cheaper, cleaner option that conventional petrol or diesel, which makes it easier for the local authority to promote LPG within the local area.

The research conducted on the supply chain for delivery of sustainable biodiesel to Norwich and then assessing the optimum blend for urban use is a particularly transferable piece of work that could be used to inform this process anywhere else, due to the fundamental nature of the work conducted.

The most beneficial investment appears to be that in biogas, which provides benefits both in terms of cost and pollution reduction. However, this depends upon the pre-existence of a CNG vehicle market and infrastructure, which is not yet the case in many parts of Europe, so highlighting the need for a wider view of energy supply policy and priorities when considering the SMILE results on their own.

Application of a clean vehicle replacement policy should be possible for any local authority, and although the vehicle and fuel technology options available may vary from location to location for the reasons already discussed, the impacts would be expected to be similar. However, the project evidence is that this will require either a strong control for successful policy implementation or a lot of work to open the minds of managers and workers within the organisation to overcome perception barriers.

Recommendations

Consider the full fuel supply chain when specifying clean fuel developments.

Consider the balance of local and global warming pollutant emissions when specifying the priority vehicle and fuel combinations as part of a clean vehicle policy.

Application of a strictly implemented vehicle replacement policy using clean vehicles should become standard practice in all public institutions, as the SMILE measures have shown that this can provide a clear contribution to emissions reduction targets and can be relatively cost effective if implemented in a co-ordinated way (UMAS example).

Do not consider vehicle and fuel specification in isolation from other measures designed to reduce the need to travel or to shift to non-motorised means where appropriate. For example, a combined hierarchy of policies is suggested in Malmö as follows:

- A. Shift procurement habits towards vehicles with both lower CO_2 and NOx emissions per kilometre.
- B. Consider new ways for city employees to execute their tasks and jobs in ways that require less total transport, this reducing the total travel work for each vehicle in use.
- C. Reorganise city administration so that the need for travel decreases.
- D. Have a program in place so that all city employees regularly take refresher eco-driving courses/instruction to reduce fuel consumption and thereby reduce NOx emissions from the fleet.
- E. Have a mechanism in place to reduce use of fleet vehicles for non-job trips (if this is a problem…).
- F. Seek to reduce emissions of NOx from traffic that is not part of the City fleet e.g. link to car clubs and local fleet operators.

To increase awareness and acceptance amongst the inhabitants of a city, do not rely upon the indirect effects of local demonstrations percolating through to the general population, but instead follow a proactive course of promotion e.g. marketing campaigns and activities to promote clean vehicles and their benefits and work with filling stations, vehicle suppliers, garages and relevant professional magazines to increase supply of all necessary elements in the chain, including ongoing support once operation has begun.

Make the effort to view these activities as long term investments and guarantee long term stability in the market both through guaranteed taxes and incentives and also lengthy contracts where possible. Also consider tying in with other initiatives such as low emission zones so that there is a direct operational advantage to the use of clean vehicles and fuels.

Public authorities to take a lead in delivering solutions so that where private sector organisations perceive a competitive advantage that they can exploit this does not hold up project development and implementation. This would benefit from improved specification of technical requirements through a better understanding of the European tender rules and how they relate to vehicle availability on the open market.

Although the work on biodiesel in Norwich has focused on developing a sustainable supply, since the start of the SMILE project the understanding of possible indirect effects of biofuels has been transformed, particularly in relation to biodiversity and broader sustainability issues. The UK Government has accepted its recommendation to slow down the mandate for biodiesel production and to sharpen focus in future years on second-generation biofuels. Further action on biofuels must be based on knowledge and expertise of these complex issues, and ideally should focus on second-generation fuels that do not create potential displacement effects (as is also the case with biofuels from waste products such as biogas and biodiesel converted from used oil).

Use developments such as LPG and CNG vehicle fuel implementation in Suceava and Potenza as a stepping stone to the use of locally sourced biogas in the medium term.

Try to avoid specifying small orders for one or two vehicles in isolation as these have a history of being given low priority by manufacturers and often lead to ongoing operational problems due to lack of local technical expertise and remedial equipment.

Continue lobbying for local legal provisions to differentiate the taxation levels for alternative fuelled vehicles in comparison with regular fuelled vehicles.

5.2 WP6: Access Management

Demand management strategies based upon access restrictions	6.1 Extended environmental zone for heavy vehicle and enforcement	Malmö
	6.2 Introduction of a Low Emission Zone (LEZ)	Norwich
	6.3 Introduction of time controlled access restrictions	Norwich
	6.4 Extension of Low Emission Zone	Suceava

The primary focus of this workpackage was three area-based access restriction schemes in the cities of Malmö, Norwich and Suceava. The characteristics of the schemes were different in the three cities, reflecting the different pre-existing local situations and hence different priority targets, namely:

- In Malmö a small central environmental access zone already existed for heavy duty vehicles. The geographic extent of the environmental zone was extended significantly, some making it much harder for older heavy vehicles that use diesel power to access locations in the wider urban area. This was done because air quality measurements in Malmö showed that air quality was not improving quickly enough to meet the local air quality objectives. Buses, lorries and other vehicles that are heavier than 3.5 tonnes are covered by the regulation, although heavy vehicles that use other fuels are exempt from the regulations and compliance with the zones. Because all buses that provide regular intra-urban services in Malmö are running on vehicle gas (an approximately 50-50 mix of biogas and natural gas), inter-urban buses that run between Malmö and Lund (the closest commuter destination) and some other inter-urban buses all run on vehicle gas, these vehicles are not subject to the zone's regulations. This means that the overwhelming majority of buses running within Malmö are not fuelled using diesel, and the focus of the zone in practice is almost exclusively diesel heavy goods vehicles.
- Just as in Malmö, air quality objectives were not being met in a particular location in Norwich. The location in question is a street in the core shopping area of the city restricted to the use of

buses, taxis, delivery vehicles (at certain times of the day) and emergency service vehicles, and which effectively forms an on street interchange for many bus services in the area. Although the pre-existing restriction on this street already indicates that buses should be the focus for this measure, the fact that nationally within the UK the bus fleet is significantly older, on average, than any other main sector of the vehicle fleet adds weight to this intervention.

- For Suceava the driver was also primarily and air quality consideration. However, in Suceava the situation at the start of SMILE was different because the city was in process of seeing a significant increase in both car ownership and also use within the city centre leading to levels of traffic, pollution and uncontrolled parking that the city was not able to cope with. The level of heavy traffic, except on the main route through the city, was on the whole quite low, and so the decision was taken to restrict access to all vehicles to the core city centre. The exception to this was buses on the main routes through the city centre, which were upgraded to provide a clean service operated by new, LPG powered vehicles.

The second type of measure involved a more localised intervention in the form of a trial of time controlled access restriction in Norwich in two streets. The key difference between this scheme and the standard pedestrian streets within Norwich was that it aimed to make maximum use of the infrastructure by allowing general traffic access for the parts of the day when pedestrian priority was not in place.

- The objective of the measure was to improve the environment for pedestrians as measured by an improvement in road safety, reduced noise pollution and reduced conflict with motor vehicles during the priority pedestrian period due to the presence of fewer vehicles. It was expected that this would lead to an increase in the number of pedestrians during these pedestrian priority periods. It is interesting to note that the reality of the data was that the actual number of recorded injury accidents was too small to be significant, meaning that any safety improvement would be one of perception rather than reality.

Impact and Process

The process of implementation of this type of measure, which has wide implications for access to the regional economic and social centres is highly political. In each case political processes were key in determining how and when the access restrictions were implemented. This process was supported by European and national legislation which sets the framework for air quality pollution limits and which, therefore, ensures that some form of action is taken in order to intervene in this way. It is, however, important to note that the method of intervention differs according to local priorities, and having this level of flexibility in approach is important in ensuring that the outcome appropriate to each city's circumstances is achieved.

In some respects it almost seems like the wider schemes in the three cities were easier to implement because this type of issue is the subject of national policy initiatives (e.g. Swedish national environmental zone legislation and revised UK air quality strategy) which mean that once in breach of the air quality standards, this type of scheme is seen as inevitable in order to meet the air quality objectives.

For the area-wide interventions, in all cases detailed technical work regarding the geographic and technical scope of the measures was carried out through a mixture of modelling and socio-economic feasibility exercises in order to justify the investments. This feasibility work tended to be fairly high-level – i.e. more focused on confirming the general scope of the interventions for the political level, rather than providing a detailed before or business as usual scenario that would have been useful for the technical evaluation of the measure.

In conjunction with the political and technical assessment work there was a degree of stakeholder engagement in all the access control measures. In some respects, this was more critical for the local intervention, where the measure was highly visible to those affected in a particularly concentrated area of Norwich, rather than the area-wide schemes. The nature of the stakeholder engagements differed significantly, ranging from dissemination-based interventions in Suceava, which were effectively information-based communications in various forms that aimed to raise awareness and acceptance of the implementation, to a much more consensual approach to the low emission zone in Norwich because it has a direct impact on the business and operational working practices of a number of important local businesses – namely all the major bus operators in the city.

Also, in all cases there is a strong element of supporting measures in order to help the access control schemes reach their goals. This comes as a mixture of higher level, long term policy formation and intervention (outside the formal SMILE project definition) and measures specifically defined and delivered within SMILE. Examples of both include:

- The policy decision in Malmö to invest in gas powered buses within the urban bus fleet which has been implemented over a number of years to ensure complete fleet compliance.
- The subsequent upgrade to vehicle gas in Malmö, done in conjunction with SMILE, so that 50% of the gas requirement for public transport is now from renewable sources.
- Part-funding for retrofitting of vehicles that use the Norwich Low Emission Zone with particulate traps and / or selective catalytic reduction devices, so that they meet the NOx and particulate emission criteria laid down for access to the zone.
- Eco-driving training to 90 bus drivers who regularly work on services passing through the Norwich LEZ.
- Research into biodiesel and the impact of NOx levels within the Norwich LEZ.
- Investment in the new public transport vehicles in Suceava and their subsequent conversion to LPG using SMILE co-funding.
- Supporting investments in public transport priority measures in Suceava.

The time controlled access project in Norwich had the potential to be a relatively small, well contained and controlled project. However, in practice it turned out to be a difficult project to implement. Even before the SMILE contract period had started, the choice of the two roads to be included had to be changed because of a lack of political support for the original proposals. This resulted in an eighteen month long process to find two alternative roads to include in the measure. This second project definition process involved a mixture of study and consultation of several options. The final choices were driven by two different issues:

- The driver for the St Georges Street scheme was the desire for the setting of St Andrews and Blackfriars Halls, The Playhouse Theatre and the Art School to be improved and for more pedestrians to visit the area. This is proven by the fact that it was the City Council's lead conservation officer which led the project.
- The St Benedict's project, which involved intervention only on Saturdays, was very much driven by the Traders Association, who made the initial approach to the City Council. (They had previously held street fairs with road closures twice a year in the street.)

The impact of implementation of these two types of scheme also had differing outcomes:

- In St George's Street it quickly became apparent that the signing and paving scheme that had been implemented were not sufficient on their own for drivers to amend their behaviour and act responsibly in the pedestrianised area.

  The timed access restriction reduced traffic levels by around 50%. However, there were still a significant number of vehicles travelling in excess of 20mph through St George's Street. This supported the complaints from the police, local residents and users of the street who raised concerns about pedestrian safety, given the speed that some vehicles were travelling at. Concerns were raised about road safety due to drivers ignoring the restrictions. Lack of enforcement from the Police was a particular issue here. The vehicle speeds were the main driver to the decision to eventually implement a physical closure in the street.

  It is interesting to note that noise levels were determined to be 52dB prior to any work taking place, 52dB when the road was re-paved and the access only restriction was introduced and 44dB when the closure was implemented. The reason for there being no reduction in noise when the access only order was implemented despite the reduction in traffic was that the block paved surface was noisier.

  Public perception surveys were undertaken and these showed that almost 80% of people thought that traffic in St Georges was too intrusive. The survey was repeated once the flush surface had been provided and while the number of people who felt that reduced, still 50% of people felt intimidated by the traffic which is unacceptable in a pedestrianised area, and contributed to the decision to physically close the road. There was a particular concern amongst the public about the vehicle speeds in the evening when the vehicle numbers were lower, and given the numbers of pedestrians in the area using the theatre, concert hall, bars and restaurants, who may not be expecting to see vehicles in a paved area, and who maybe under the influence of alcohol.

- The closure in St Benedict's Street was introduced on an experimental basis, for up to 18 months, and authority was given to the Head of Transportation and Landscape to vary the times on a Saturday when the road was to be closed, and to vary the sections of the street to be closed.

  In the first 3 weeks of operation a considerable number of complaints were received from traders in the street about the negative impact of the closure. Many traders complained that they were not an active part of the traders association and had not been included in the original survey that resulted in the decision to request a Saturday closure; others said they had moved into the street in the 12 months between the original traders' survey and the date of the first closure. It was therefore decided to carry out a consultation with all traders to determine if the experimental closure should continue. This survey showed that of the commercial frontages on the street 35% supported the Saturday closure and 65% opposed it. In light of this and the problems associated with enforcement, it was decided to cancel the experiment after six weeks.

  This raised important questions about the method of consultation and while it is essential to involve stakeholders, in such instances as the association may not reflect the views of the whole street, and too much reliance can be put on the views of one section of the community, even if it is the official representative organisation; effort must be made to consult all stakeholders at an early opportunity.

In terms of impact, the focus of the access restriction measures in Norwich and Malmö is to speed up the emission reduction to a greater extent than that which will be brought about by the natural renewal of the vehicle fleet. As such this means that the measure should have a medium term impact on air quality. Data shows that although there is a slow downward trend in Norwich for particulate levels, and emissions per vehicle are decreasing, there is a correlation between the number of buses and the overall level of NO_2 measured in the LEZ. As the number of buses in the area increases, as would be desirable if public transport is to take a significant modal share of the transport market, then the specific local problem will take further effort to meet the emissions levels.

It needs to be remembered that the contributions to air quality are manifold and quite disperse, with background values playing an important role. This is important because transport is just one of many sectors that contributes to poor air quality, as pointed out in Suceava where increased economic prosperity has resulted in increasing investment in individual central heating systems in city centre residences and changing trends in the overall pollutant distribution in the core central area.

Nonetheless, the contribution of transport emissions to air quality is important. This is both a direct and an indirect effect when considering emissions within a city centre low emission zone because transport-related emissions that are produced outside the designated zone make a significant contribution to the background levels. Therefore, wider zone designation will be important both indirectly the core area, through reducing the effective background levels as well as directly in the additional areas that are covered.

The intervention in Suceava differed slightly to those in Norwich and Malmö as it focused less on heavy vehicles and also targeted the use of private vehicles in the core city centre, for reasons not only of air quality, but congestion and wider quality of life. In this respect there is potential for a greater step change in the local air quality impact, subject to the contribution from background sources from outside what is a relatively small area.

The speed of impact of the measures in Norwich and Malmö appears to be relatively modest and on this basis it might be predicted that with increasing levels of private traffic being predicted in many European urban areas, the time will inevitably come when the scope of environmental access zones will need to be extended to include private cars. Evidence for this comes from the evaluation in Norwich where there is a correlation between the NO_2 levels recorded and the number of buses that enter the LEZ. Although the emissions per vehicle are lower for private cars, the sheer volume in circulation means that they produce the majority of the transport emissions as a whole. The question that remains is the most cost effective and equitable way in which to address the issue.

Cost Effectiveness

Some limited cost effectiveness data has been derived for measures 6.1 in Malmö and 6.2 in Norwich. The basis upon which the data has been collected differs, but because of this provides an interesting comparison of the true costs of such a measure and where the costs might be felt depending upon the implementation framework that is established.

Total costs for the measures as implemented in SMILE are shown in Table 5.2.1. The Cost effectiveness values for measure 6.1 and 6.2 are then shown in Table 5.2.2.

Table 5.2.1: Indicative Absolute Values of Cost and Impact for the Measures in Workpackage 6

	Total Cost (Investment and operation)	Net Cost (After revenue / reduced operating costs)	Period	Annualised net cost	Comments	Impacts		
						CO_2 reduction	NOx reduction	PM_{10} reduction
6.1 Extended Environmental Zone, Malmö	€59,177	€59,177	4 years	€14,794	This cost data reflect the costs solely to the public administration in implementing the extended environmental zone. In practice, an investment is required in either new vehicles or emission abatement technology for the heavy vehicles to meet the new standards, which will need to be met by vehicle operators. In the case of HGVs this is likely to require a significant private sector investment unless some form of public financial support is available. The zone will of course also apply to public heavy vehicles such as refuse trucks and also public transport vehicles, although these are already operating largely on gas in Malmö. However, the cost effectiveness of these type measures is already shown in table 5.1.1 in workpackage 5, or see below for measure 6.2.	29 tonnes per annum	10,000 kg per annum	370 kg per annum
6.2 New Low Emission Zone, Norwich	€681,388	€681,388	10 years	€68,139	The low emission zone implementation in Norwich was accompanied by a programme of financial incentives to help the vehicle operators meet the costs of the emissions abatement technology necessary for the heavy vehicles to	Not assessed	19,700 kg per annum (partial assessment)	430 kg per annum (partial assessment)

	Total Cost (Investment and operation)	Net Cost (After revenue / reduced operating costs)	Period	Annualised net cost	Comments	Impacts		
						CO_2 reduction	NOx reduction	PM_{10} reduction
					meet the new standards. This is in direct contrast to the situation in Malmö, and can be seen as important because these costs comprised over half the total measure costs in Norwich. The costs shown in this table are the total measure costs, whilst the NOx reduction is merely the reduction calculated as a result of fitting CRT/SCR technology to 25 buses operated by Neaves Buses.			
6.3 Time Controlled Access Restrictions	€432,402	€432,402	20 years	€21620	The vast majority of the costs associated with this measure were the changes to the street infrastructure, primarily the new road surface when the time controlled restrictions were implemented in St George's Street. The annualised cost recognises the long term nature of such infrastructure investment.	Not assessed	Not assessed	Not assessed
6.4 Extended Emission Zone, Suceava	€212,092	€212,092	15 years	€14606	As for 6.3, the vast majority of the costs associated with this measure were for changes made to the street infrastructure. In this case it was primarily a short new road link to divert traffic away from the city centre square to the main diversionary route. The annualised cost recognises the long term nature of such infrastructure investment.	Not assessed	Not assessed	Not assessed

Table 5.2.2: Cost Effectiveness Summary of the Measures in Workpackage 6

Measure	CO_2	NOx	PM_{10}
6.1 Extended Environmental Zone, Malmö	€152.5 / tonne	€0.45 / kg	€12.3 / kg
6.2 New Low Emission Zone, Norwich	Not assessed	€3.21 / kg	€147.3 / kg

Tables 5.2.1 and 5.2.2 shows that the cost to the public sector of implementing low emission zones can be relatively small, but that it most be recognised that there is a direct investment that needs to be made though accelerated vehicle renewal, investment in clean fuel technology or retrofitting emissions abatement technology to existing vehicles. The size of this investment could be substantial – the example used to calculate the cost effectiveness values for the partial assessment of measure 6.2 in table 5.2.2 is the €316,000 investment in retrofit technology for 25 buses owned by Neaves Buses so that they could continue to operate in the Norwich low emission zone and so fulfil their full operational life.

This type of investment is effectively the same as that covered in workpackage 5, which emphasises the links between the two workpackages.

Upscaling

There is scope to widen the scope of all the measures in this workpackage further. However, the question that needs to be answered in this context is whether it would be beneficial to apply the existing measure to a wider area or introduce more complete restrictions to the existing area, or a combination of both.

In fact, two of the formal LEZ measures that have been implemented in workpackage 6 are actually upscaling projects of previous low emission zone schemes. One of these is a more general restriction to all traffic in central Suceava. It seems unlikely that a further widening of the full traffic restriction could be applied without having an impact on the economic success of the city centre, and the bus fleet has already been upgraded as a part of SMILE. However, there could be scope for application of an environmentally based restriction to heavy goods vehicles accessing the city centre, although this may be difficult to apply until an adequate ring road is in place.

The extended zone in Malmö could be applied further to the region, because as the evaluation has shown many of the heavy goods vehicles that access the city are based in the wider region, and this extension would merely put this on a firmer, more equitable basis across the area that is already being affected. It would also be worth considering increasing the scope of the Malmö zone to cover either all vehicles in specific locations in the city (as in Suceava), or if an environmental classification could be introduced, which would be in line with the steps taken in measure 7.1 to promote the use of clean vehicles for trips in the city centre through subsidised parking.

The nature of the low emission zone in Norwich is slightly different in that it is a first intervention, using a relatively simple legal instrument and working in partnership with bus operators, to influence a limited proportion of the vehicle fleet. The logical next steps for any upscaling would be to consider other areas where buses predominate and then to look to heavy goods vehicle emission standards within the city centre.

Theoretically it is possible to introduce time controlled access restrictions on other streets and, indeed, it still remains the long term of Norwich City Council to complete the scheme originally identified to be part of the project – Westlegate. However the type of street suitable for such an approach needs to be carefully considered, there needs to be a reason why the closure is part time, a reason for the street to be closed in the first place and an understanding of whether the part time closure can be physically achieved.

Transferability

The assessment of the three low emissions zones has shown there are subtle differences in the nature of their application. However, in broad terms there is significant opportunity for transfer and indeed, this type of measure makes the perfect focus for a city’s intervention to improve its transport system and the effect on the local quality of life, as it can drive wider change when linked into supporting measures of the types included throughout the CIVITAS work programme.

There appears to be reasonable scope for transferring the timed access restriction measure elsewhere, particularly in cities with historic city centres and difficult access conditions for modern motor vehicles, providing some key criteria, including adequate enforcement can be met. The measure leader recommends that implementation could be taken forward by other cities that have similar air quality issues to those in Norwich. Key questions to address when transferring the measure elsewhere are:

- What are the key reasons for taking this approach?
- how will set up and running costs be funded?
- how to engage stakeholders?
- what are the appropriate arrangements for data collection and monitoring?

Recommendations

Regular enforcement of the zone is required together with a good level of signage and information to avoid a culture of ignoring the zone developing, linked to a feeling of perceived indifference on the part of the scheme promoters/implementers. Given the international nature of freight transport services it is important that at least the basic scheme information is available in non-native languages.

Cars and similar light vehicles make up the majority of traffic volume in European cities and the city authorities will probably need to consider an environmental zone for cars because, given predictions of ever increasing overall traffic levels it seems unlikely that the low emission zones as currently defined will be sufficient to meet future air quality targets. When considering this it will be important to ensure that it is done with the provision of an appropriate level of alternative personal transport such as bus and park and ride services.

These projects have focussed on a narrow range of pollutants (NOx and PM_{10}) and have considered air quality and not impacts on climate change. However, in the future it is vital that councils consider emissions of greenhouse gases and air quality pollutants together and take a holistic approach when considering the combined issue of climate change and air quality. This would involve ensuring that abatement technologies do not have disbenefits for CO_2 emissions and do not impinge on local/national commitments to reduce greenhouse gases. At a basic level, a measure that results in a ‘win’ for air quality and a ’win’ for climate change would be one that reduces the emissions of all pollutants that are important to both issues.

The role of other support measures has been shown to be essential in making this type of measure work. In contrast to all the successful examples within the evaluation, it can also be seen that support measures do not always come to place unless they are promoted – the example being the provision of LPG to fuel taxis in Norwich, whereas this was achieved in Suceava.

It is essential that early consultation is undertaken with all affected stakeholders at the earliest possible stage. It is important to work in partnership with any vehicle operators that will be affected to reduce vehicle emissions, providing them directly with assistance, support and information to help them identify practical solutions for retrofitting of emissions reduction equipment that will not unduly burden them with additional costs. In addition to this immediate information wider information about the scheme should be produced and shared with the general public to show them the policy initiatives being taken on their behalf by the local authority in order to increase the chances for buy in to other initiatives in the future.

For time controlled access restrictions:

- The location and physical characteristics of streets should be taken into account when considering time controlled access restrictions. To aid implementation and enforcement, streets should have a very limited number of points of entry, and should not give access to significant amounts of off street parking to which access needs to be maintained.
- Consider the justification for implementing time controlled access restrictions on a particular street. When choosing a street that should have these restrictions, it is important that the public can see a reason why the street is closed at certain times and not at others, otherwise enforcement will become an issue.
- Politicians must be engaged at an early opportunity in order to avoid wasting much time and effort.

5.3 WP7: Demand Management & Integrated Pricing Strategies

This workpackage is the smallest in SMILE, containing just two measures:

Demand management and revenue raising strategies based upon integrated pricing strategies	7.1 Marketing of clean vehicles by subsidised parking	Malmö
	7.2 Influencing the choice of vehicle towards smaller and more fuel efficient vehicles	Norwich

The premise in both cases was to influence the choices that individuals make regarding their purchases of private cars. Given the rate at which new cars are brought into the vehicle parc – on average a car is used for 10-12 years, and longer in some cases.

The impacts of such long term measures are likely to be felt only over a long period of time – much longer than the 4 year SMILE contract period and certainly longer than the year that was available for evaluation within the project after the planning and implementation phases.

Given this timescale the results observed from the SMILE evaluation can only be seen as initial indications of the measures' impacts and effectiveness.

Although the measures are both aimed at influencing private vehicle purchases, and do so through a mechanism that relates to the cost of parking, there are also significant differences between the measures.

Measure 7.1 in Malmö focuses on promoting 'clean vehicles', a definition that is primarily based on low levels of local pollutants such as particulates and NOx, although may also, as in the case of biomethane, include vehicle and fuel combinations which may be considered 'low CO_2'. The differential charging mechanism is operated through a subsidy for parking that is operated by the City of Malmö, and as such is concerned with parking whilst making trips to destinations with in Malmö city centre.

Measure 7.2 in Norwich focuses on promoting smaller / more fuel efficient vehicles, a combination that does not necessarily relate to low levels of local pollutants such as particulates and NOx, but instead looks to influence the choice of vehicle within the more conventional mainstream options that are available. The differential charging mechanism is operated through a charge for parking that is made by the City of Norwich where cars are parked in on-street residential areas where off-street parking is not available to the majority of residents. As such this measure is more closely related to the ownership of the vehicle as it is not possible to avoid this charge if you own a car and live in certain parts of Norwich, given the lack of parking facilities available.

In both cases there is a potential for the measure to encourage a counter effect (to the overall sustainability objectives) of greater vehicle ownership and use. In Malmö the effect is more likely to be felt in terms of greater use of clean vehicles as the price of parking for clean vehicles in the city centre would be cheaper, whereas in Norwich the effect is more likely to be via increased numbers of vehicles being present if the measure is successful as it would be possible to park a larger number of smaller cars within the fixed space available. (This is a deliberate acknowledgement of suppressed parking demand on the part of Norwich City Council and will act as a way of making the measure more welcome to the .) Given the long term nature of the measures, just as the direct impacts of the measures are only likely to be felt over time, it is also likely that these secondary impacts would only become visible over a period of years, if at all.

The costs of implementation of the two measures have been relatively low in comparison to many of the other measures implemented in SMILE. This is in part because they are relatively easy to integrate within the wider policies and activities of the local authorities and also because they do not require significant purchases of equipment.

For Measure 7.1 the total implementation cost was around €27,000, most of which has been recouped through the sale of the 3 year scheme permits. It has not been possible to isolate the impact of the measure on parking charge receipts in Malmö. This is, in part, a deliberate action of the city authority, as they were worried about the impact of significant take-up of this measure on parking revenues and actually changed the measure from being one of free parking to one of subsidised parking because of this very point. However, this does also raise a question as to the effectiveness of the scheme if a change in revenues cannot be clearly identified. It has been observed within the measure evaluation that the changes in the nature of the vehicle fleet in Malmö are likely to be influenced more by the national incentive scheme than the local, SMILE measure. However, the overall effect will be a combination of both these financial incentives, as well as personal environmental motivations.

For Measure 7.2 the total implementation cost was higher at around €82,000. The scheme in Norwich was designed to be revenue neutral – i.e. not to impact upon overall receipts from the sale of residential parking permits, as the lower cost of permits for small cars was offset by an increased cost for larger cars. Once set up and incorporated into the City's parking management procedures there is no cost for keeping this system working over the next few years, which means that the impact can be felt over the long term implementation period that is necessary for such a measure.

The cost effectiveness of these measures is generally favourable, as shown in the following table.

Table 5.3.1: Cost Effectiveness Summary of the Measures in Workpackage 7

Measure	CO_2	NOx	PM_{10}
7.1 Marketing of clean vehicles by subsidised parking	€1.76/tonne CO_2	€2.2/kg	€32.5/kg
7.2 Influencing the choice of vehicle towards smaller and more fuel efficient vehicles	€5.3 - €46.8 / tonne CO_2 depending on the extent to which new vehicles are actually encouraged by the extra parking space that becomes available	Not assessed	Not assessed

This type of measure would benefit from in depth research into its long term effectiveness to confirm the initial recommendation that it is a worthwhile instrument for local authorities to implement. This research should also cover the specific aspect of what is the most appropriate aspect to which the charges should be related (i.e. vehicle length, fuel consumption, CO_2 emissions local pollutant levels or some combination of these factors).

This decision would contain a political element, as it would depend upon policies at European, national and local levels. However there is already a political element associated with both measures due to the relationship with local policies such as accessibility and parking (and the important associated revenue streams).

5.4 WP8: Stimulation of Collective Transport

Stimulation of collective passenger transport and its quality of service.	8.1 Marketing of new bus route system	Malmö
	8.2 Improved security and safety on buses	Malmö
	8.3 Integration of cycling with public transport	Malmö
	8.4 Rail station interchange	Norwich
	8.5 On street ticket vending machines	Norwich
	8.6 Linking individual passenger transport information with healthcare appointments	Norwich
	8.7 Demand Responsive Transport System	Potenza
	8.8 Bus priority measures and other bus improvements	Suceava
	8.9 Improved Public Transport Information	Suceava

Impact and Process

Measures 8.1 and 8.2 together with measure 8.3 (Integration of Cycling with Public Transport) in the long term will provide infrastructure and the availability alternative modes of transport which are sustainable than the private car transport in Malmö.

The overall goal of the measures 8.1 and 8.2 was to contribute to a 10% increase in the bus travel by the end of 2006 and a 30% increase by the end of 2010.

The main target of the Measure 8.1 was to inform travellers about the new bus route system by campaigns, signs, events and information materials and by re - designing the bus system, to reduce travellers' waiting time for buses and improve travel times.

The measure has an impact on travel behaviour by increasing the level of awareness about the new bus system within Malmo city. It is difficult to estimate the effects of the marketing campaigns on the number of passengers and their impact on travel behaviour as the main part of the marketing campaign coincided with the actual change in the bus system.

The measure has the potential to offer bespoke integrated transport if promoted together with the main points of interchange between various modes of public transport and other sustainable modes of transport (e.g. the cycling parking facility).

The measure is part of the bigger picture that aims to influence transport behaviour and to promote the modal shift to more sustainable modes of transport and increase the usage of public transport.

The overall objective of measure 8.2 was to increase the attractiveness of city buses in Malmö by developing a security strategy and installing security cameras for increased security and safety in 185 buses (approximately 4 cameras per bus).

Increased safety and security risks such as vandalism and violence were the main reasons for public transport users to avoid taking the bus, particularly in the late evenings or night time. The measure aimed to increase the public transport use by addressing issue of security and public safety on buses.

After the cameras have been installed in the buses, passengers said that this has improved safety and security. As a consequence of improved security public transport users said that they tend to use the public transport more than they did before and they are willing to pay a fare price for the ticket for the additional security cameras.

This characteristic is transferable to any city or public transport provider where similar strategies need to be applied to enhance personal security on the public transport and increase the safety as a working environment. The success of the transferability depends on the scale of the project.

However, this measure has a complex dimension in terms of the parties that could be involved when such strategies need to be enforced. The complexity derives from the decision made by the public transport authorities, the bus operators, police and none the less the politicians who decide if there are any personal privacy issues. This characteristic has the potential to be transferable when a common and mutual agreement is reached between all parties involved and when such measures are within the limits of local/national legislation.

At the start of SMILE there were already 390 km of cycling lanes in and Malmo, which was one of the leading European cities regarding the provision and use of the cycling infrastructure. The overall objective of measure 8.3 was to develop and extend the already existing cycling routes, to establish two high security bicycle parking facilities, to promote cycling and to increase cyclists' safety and convenience.

While the original project prioritised a better integration of cycling, as a sustainable mode of transport, with the major interchange points of public transport such as the Central Station Complex. Due to the refurbishment and additional construction works carried out in the Central Station Complex led to significant changes in the process of implementing the measure.

The measure has led to significant improvement in the levels of safety for cyclists by introduction of bicycle radar detectors to improve safety in intersections and reduce waiting time in intersections. The introduction of bicycle detectors was accompanied by the introduction of demonstration bicycle lanes; the two components were supported by the marketing campaigns in order to improve cyclists' awareness of the new cycling lanes, to change public's perception about cycling and to promote cycling not only as a sustainable mode of transport but as an activity with wide health benefits.

Although the environmental impact of the measure is unquantifiable, the measure has wider benefits such as influencing travel behaviour by promoting cycling as more accepted mode under the motto: "This is a motorist on a bike" and encourage the shift to more sustainable modes of transport.

Measure 8.4 (Rail Station Interchange) implemented in Norwich focused on providing easy access and frequent connection bus services from the train station to the city centre. The interchange point involved redesigning the station forecourt to cater for the bus stops which were provided with high quality waiting facilities and real- time passenger information panels.

The measure had an impact on the number of public transport users which has increased after the implementation of the measure by 9%, and on travel behaviour by influencing the choice of transport mode to work; it also led to a 12% increase of the number of those travelling to work five days a week which highlight a shift towards more frequent bus travel.

The measure also increased the frequency of usage of bus services to the town centre and improved the perception of the public transport users about the security, safety, accessibility and frequency of the bus services from the train station to the town centre.

Although it was not possible to enlarge the train station's forecourt in order to increase the space for additional bus services, due to the loss of the revenue brought by the provision of parking spaces at the train station, consent on this matter was reached between the involved stakeholders. However, the key stakeholder was the station landlord or the rail stakeholder who had to approve the development, but the implementation process also involved different bus/transport operators (Anglian, First, Norfolk County Services, Simmonds) and the contractor constructing the interchange site.

The measure developed a good practice code which could be adopted in future planning and development of small to medium size public transport interchange schemes; to improve passengers perception on safety and security, adequate level of lighting in and around the interchange waiting area and cycling parking facilities should be provided together with of sheltered waiting area which could be designed as a separate area from traffic. The sheltered area should be sufficiently enclosed to protect from unfavourable weather but opened enough to contribute to positive perceptions.

In order to identify bus stops or clusters of stops where interchange facilities could be developed, it is important to make good use of the local knowledge of the public transport network and also to engage the public transport users by public consultations using methods such as face to face interviews and self completions questionnaire. The possibility to link with state of the art real time information systems should also be investigated.

Measure 8.5 (On street ticket vending machines) focused on installing 15 on street ticket vending machines (TVM) in strategic locations such as the central bus and rail stations, city central, the University of East Anglia (UEA) and Norwich University Hospital. The measured aimed at increasing the number of public transport users by improving the journey and waiting time of bus services and also the efficiency and reliability of bus services.

The measure had the potential to provide additional revenue and cost savings for the bus operator. Although the number of tickets sold by the machines varied from location to location, the most popular machines sold a significant 1000 tickets per month. These machines were located in the central bus station and UEA bus stop.

The sales of tickets from the TVMs were influenced by promotion materials and actions of local bus operator. The sales of ticket from the machine in the vicinity of the University halved after the bus operator issued a special ticket for students which was not made available at the vending machine on the street.

From an operational perspective the contractor appointed to conduct the maintenance of the machines plays a key role. In the Norwich case, the change of the contractor led to 90 - 100% availability of the TVMs, the percentage of the machines being out of order dropped significantly, and an increase in the number of users by making the location of the machines visible on the streets and by providing clear instructions for their use. However, another element to be considered, particularly when transferring this measure to different cities, is the public transport operating framework and the need to build a relationship with the bus operators as changes in the route system might affect the ticket sales from VTMs.

The usage of the machines could be stimulated at a local level by the bus operators who could adopt the policy not to sell tickets on the bus. However, such policy could have a negative impact on the public transport performance and public's perception.

Unlike the other measures in the workpackage, measure 8.5 is expected to generate revenue between 1,500 Euro in the Year 1 and 2,327 Euro in Year 10. However, the revenue generated by the measure is still insufficient to cover yearly operational costs (7,000 Euro, after Year 4).

Measure 8.6 (Linking individual passenger transport information with healthcare appointments) explored the potential of collating all relevant information about transport options and presenting it in a customer friendly option, as part of the hospital appointment letter. However, when the key partner, Norfolk and Norwich University Hospital withdrew due to reasons independent to CIVITAS, it was not possible to find alternative partners to deliver most of the elements planned by the measure.

Therefore, the measure focused on improving transport information to health care users, overall. Although, leaflets, information posters were designed and radio campaigns were launched, the feedback was expected after the SIMLE deadlines.

Implementation of this measure highlighted many problems about forming partnerships with strategic partners in the UK health sector in order to deliver a direct travel service to patients and visitors to the main hospital in Norwich.

Measure 8.7 (Demand Responsive Transport Service) focused on implementing a demand responsive public transport system (DRTS) in the area around Potenza, which is defined by an urban centre but with villages dispersed on a wide area. Given the particular configuration of the area, it was proposed to implement “Dial a Ride” public service in order to provide sustainable mobility for the public transport users and reduce the number of private car journeys

However, despite designing the public service system and identifying appropriate solutions to the DRTS implementation, the main implementation partner left and this factor generated delays and in the end failure to implement the measure.

The key result of the measure is that the operational costs of the demand responsive services could claim up to 100,000 Euro per year and it is likely to be subsidised by the local authorities as part of their contribution to provide mobility for people in the peripheral areas.

Although, the current transport system that is operated in the areas with low population density surrounding Potenza, is fragmentary and inefficient, the DRT will not be implemented until a new public transport operator that will operated a service based on demand responsiveness, will be identified. It is also recommended that the DRT service operator should be a local partner, familiar with the area and requirements of running an efficient and effective service.

Measure 8.8 (Bus priority and other bus improvements) and Measure 8.9 aimed to increase the number of public transport users and to reduce the environmental impact of the local car journeys over the 3 years by supporting and upgrading the public system using priority measures at junctions or traffic lights as well as experimenting on a GPS vehicle location system and new ticketing system.

The results show an increase of public transport users by 757% (from July 2005 to June 2008) triggered by the improved quality of public transport. The indicators assessed showed that passengers’ comfort, personal security, trip duration accessibility of the buses within the bus stops, drivers’ attitude and availability of real time information, were highly valued by the passengers.

Suceava Municipality reviewed its transport strategy and acknowledged that accurate information about public transport services plays a crucial role in increasing and improving the public transport usage. However, despite prioritising the bus service in junctions, delays in the service were encountered due to wintry weather or road works caused by the actual implementation of the measure.

A quantitative evaluation of the measure on the overall traffic and emissions has not been possible due to the lack of an appropriate traffic model in Suceava. However, the impact of the measure on reducing emissions is less significant than the measure 5.8 which was the introduction of LPG buses.

The Measure 8.9 focused to provide an efficient public transport system with reliable service during off – peak and on – peak hours. As part of the measure implementation VMS (variable message signs) were implemented as well as timetables displayed in visible locations and in the mobility centre, which is situated inside the town hall building. The Mobility Centre was the instrument chosen to make available public transport information and other information of public interest. These communication means were supported by public information campaigns by which information leaflets, free bus tickets and signs were distributed to public transport users.

As mentioned above, together with Measure 8.8 the number of public transport users increased considerably after the Measure implementation and surveys carried out in 2008 shown that 22.6 % of respondents use VMS’s to find public transport information.

Upscaling & Transferability

This measure has the potential for transferability as it is important to increase the number of public transport users and increase awareness about different changes in the bus routes. Supported by easy to understand information about the new bus system, improved transport services and within the budget implementation costs this measure has proved an efficient way to improve the public transport system.

The approach to the marketing campaign was to divide the city into different areas and the residents from each area received a tailored information package rather than to creating a standard information package for all the residents in Malmo. This approach appears to have worked well and could be useful to other cities where the public transport services are reorganised.

Regarding the upscaling and transferability potential of the safety and security measures on the public transport, these aspects are highly valued by the public transport users. To maximise the personal safety, within the legal compliance, cameras could be installed not only on the buses that travel within one city but also, on the regional buses and at the bus stops. However, such a thorough strategy requires a tactful approach as political resistance and public outcry could be encountered.

In Malmö, the bicycle radars do not currently operate during the peak periods because of the risk that they would delay the car traffic too much, which partially defeats the object of the measure. The easiest way to upscale the measure would be to extend the operating hours of the bicycle radars and by reducing the waiting times for the red light in intersections, throughout the day and particularly during the peak times, promote cycling as more attractive, faster and sustainable mode of transport, preferable to the private car. In addition to this the implementation of more bicycle radars could improve cyclists' travel times by reducing the waiting time at red signals, in both directions of the roads, although to achieve these conditions, some reconfiguration of the streets and junctions might be required.

Upscaling the implementation of the demonstration cycle lanes and the provision of cycling infrastructure, these could be more spread and more concentrated in some parts of the city so that a complete cycling network is available for use as reliable alternative mode of transport. Also, the marketing campaigns could be broken down by region/area so that in particular residential areas are targeted.

The measure has great transferability potential to other cities, although the concept could be adjusted and implementation of the cycling infrastructure could be adapted to the city's / streets' layout. To make sure that the objectives of the measure are met successfully, marketing campaigns to promote cycling as a mode of transport with benefits not only for the environment but for public health, could be useful.

Multimodal transport interchanges are already common. The particular issue that was addressed via the rail station interchange in Norwich is the fragmentation of the public transport responsibility and infrastructure (different infrastructure ownership and transport operators). In locations where this fragmentation is not a side effect of the institutional framework these issues should not be an issue.

In terms of upscaling the results of the interchange measure in Norwich, specific sites where similar interchange facilities to those at the railway could be implemented (e.g. Anglian Square, Tombland and University of East Anglia) have already been identified. These sites are in key locations either in the vicinity of the University or the local hospital or in key tourist attractions. In addition to the sites mentioned above there is potential for upscaling some of the good practice measures to public transport links located in strategic areas such as large business/employment areas, supermarkets and shopping centres.

There is clear potential to upscale the deployment of the ticket vending machines with up to another 100 machines located in key interchange stations and routes being provided. However, the provision of the machines will not guarantee the same level of ticket sales as the number of tickets sold varies from location to location.

The lack of success of the measure linking transport to healthcare appointments in the UK highlights the lack of coherent policy decisions across departments and organisations in the UK. When considering the transferability of the measure to other cities the development of a business case is recommended in which cost savings and improved efficiency due to fewer missed appointments could be illustrated to different potential partners, so that a direct benefit can be identified and used to justify participation.

When considering transferability of the measure to similar cities it is recommended that building up a partnership with the local public transport operators as well as the local authorities, although the ongoing cost of subsidising this sort of measure is a clear barrier in many circumstances.

Measures 8.8 and 8.9 have high transferability potential to other cities where upgrading the public transport service has to be co-ordinated with methods of informing the public transport users about the new pubic services, timetables, improved travel conditions, facilities, and available public transport information. The measures have high potential for transferability due to the fact that they show and reinforce the importance of the bus as a mode of transport, particularly after the type of vehicle upgrade that occurred in Suceava.

It is also suggested that when similar measures are transferred to other cities, a step by step approach of each measure implemented in Suceava, for demonstration reasons, could be considered.

Although sometimes difficult to deal with, Suceava Municipality owned and controlled not only the single provider of pubic transport services, but the road network and the planning and development system within the city. In dealing with the public transport operator regarding the data and technical information needed to be made available to the public, the municipality’s single ownership over the transport operator was in some respect, fortunate. However, this case is unusual and in the transferability of similar measures is recommended that public tenders should be called so that the public information data could be managed at the technical level required and further problems with the system compatibility avoided. Nonetheless, public consultation about how the content of the data to be presented and where the VMS to be located, should be conducted.

Costs

The costs of the measures in workpackage 8 are significant due to the need for investment in equipment and infrastructure.

Table 5.4.1: Indicative Absolute Values of Cost for the Measures in Workpackage 8

	Total Cost (Investment and operation)	Net Cost (After revenue / reduced operating costs)	Period	Annualised net cost	Comments
8.1 Marketing of new bus route system	€337,598	-€566,365	4 years	-€141,591	Although primarily implemented in year 1, costs were incurred for follow up activities in years 2, 3 and 4. Revenue is attributed due to the increases in patronage and associated income.
8.2 Improved security and safety on buses	€891,240	€891,240	4 years	€222,810	Costs are almost entirely those of the equipment purchase in year 3.
8.3 Integration of cycling with public transport	€835,466	€835,466	15 years	€55,698	Dominant costs are for infrastructure and sub contractors who installed equipment.
8.4 Rail station interchange	€658,170	€658,170	20 years	€32,909	Dominant costs are again for infrastructure and sub contractors who installed equipment.

	Total Cost (Investment and operation)	Net Cost (After revenue / reduced operating costs)	Period	Annualised net cost	Comments
8.5 On street ticket vending machines	€513,759	€494,157	10 years	€49,416	Costs are almost entirely those of the equipment purchase in year 2.
8.6 Linking individual passenger transport information with healthcare appointments	€11,959	€11,959	3 years	€3,986	Costs are low and primarily linked to staff efforts to engage unsuccessfully with the hospital staff and look for alternative implementation sites.
8.7 Demand Responsive Transport System				€100,000	Approximate ongoing costs required of the municipality in Potenza to support the DRT service.
8.8 Bus priority measures and other bus improvements	€110,233	€110,233	15 years	€7,349	The extent of the infrastructure installed in Suceava was relatively low due to the compact nature of the city.
8.9 Improved Public Transport Information	€159,946	€159,946	8 years	€19,993	Costs are associated with feasibility and testing followed by investment in equipment in year 4.

5.5 WP9: New Forms of Vehicle Use and Ownership

New forms of vehicle use and/or ownership and lifestyle.	9.1 Car sharing for business and private persons	Malmö
	9.2 Development of a car sharing club	Norwich
	9.3 Development of a car pooling	Potenza

Impact and Process

Measures 9.1 and 9.2 both involved the delivery of a car club service with provision of cars. However for measure 9.1 the service was aimed at businesses and individuals and for measure 9.2 the service was aimed at individuals. Measure 9.3 differed in that it involved setting up an operating centre to match employees of companies wanting to car share.

Measure 9.1 was intended to, and did, operate on a larger scale than measure 9.2. For 9.1, the objective of establishing five car sharing locations with a total of 15 cars was realised. The measure leader highlighted the importance of selecting good strategic locations close to both companies and private homes. For 9.2, it was intended to set up two car sharing clubs with a total of 10 cars. After implementation, one of these locations, a university campus, was withdrawn due to poor usage levels for various reasons. These included ineligibility of undergraduates for car club membership as they were unable to obtain insurance. The other location remained operational, with five cars.

Measure 9.1 also provided a more environmentally friendly fleet of cars than measure 9.2. The fleet consisted of biofuel/flexifuel cars, electric hybrids and gas hybrids. However, there is some uncertainty about to what extent all of the distance driven by fleet cars has replaced previous trips in petrol-fuelled cars. As noted below, the measure may actually have increased car use. In terms of corporate kilometres, it seems that use of Sunfleet cars has replaced use of employee cars and thus total car use has been reduced. In terms of household kilometres, the picture is much less clear. The fleet of cars offered by measure 9.2 were all diesel. They had lower emission rates than the UK average, although some compromise had to be made between maximising fuel efficiency and giving a choice to car club members.

For measure 9.1, there was no evidence of a decrease in car use by car club participants. The evidence is limited due to the small sample size of evaluation surveys conducted; however, it appears that the club may have been more popular amongst those who did not previously own a car. Measure 9.2 was more successful in changing travel behaviour, as 26% of car club members gave up a private car. There was a 17% reduction in short journeys by car, a 12% increase in cycling and 9% increase in walking. Local public concerns about fuel price increases, climate change, congestion and parking problems helped drive the measure.

Measure 9.3 had the most limited impact, mainly because of its late delivery. It was delayed due to changes in the project consortium and difficulties in including more than one company in the car sharing partner finding service. Results were based largely on market research about the measure’s potential. Around one third of those surveyed were not interested in participating in the service and similar proportions would accept participation and pay for it, or would accept participation if free.

Upscaling

There appears to be good potential for upscaling the two car club measures, with several avenues that can be explored. This includes linkage to other sustainable transport measures. 9.1 is the more developed measure and upscaling is already underway with expansion to seven sites. There is opportunity for further expansion to the suburbs of Malmo and a nearby city. However it may be desirable to undertake further monitoring to determine whether club members’ car use is increasing or decreasing. The latter could be promoted by linking to another upscaling opportunity identified by the measure leader. That is, to link the car pools to public transport and possibly cycling schemes, to encourage citizens to use car sharing in conjunction with other sustainable transport modes.

The Norwich car club also aims to expand; this is important as club must become self sustaining after SMILE start up funding, by achieving a critical mass of around 20 vehicles. The priorities are to introduce the scheme in the city centre, reintroduce it at UEA, and work with developers and large local employers to promote car clubs at new development sites and for business use. It has been suggested that eco driver training could be offered as part of the club membership package (see section 4.2.7).

Some potential for upscaling of measure 9.3 has been identified, but it this is difficult to assess given the delay to measure implementation and the need for further evaluation. The main aim is to extend the target group to include employees of more firms. Measure 11.4 is also concerned with promoting car sharing, but was more sophisticated as formal car sharing schemes were established. In the long term, measure 9.3 could learn from the upscaling experience of measure 11.4.

Cost Effectiveness

As shown in table 5.5.1, the total net cost of measure 9.1, was significant at around €480,000., much of which was set up costs associated with establishing the necessary systems and marketing, given the relatively complex structure followed. Interestingly the additional costs of choosing clean rather than conventional vehicles did not appear to be significant in comparison. The level of revenue generated has begun to pick up so that the system is expected to break even / make a profit from now on as the system is functioning well and further set-up investments are not anticipated.

Table 5.2.1: Indicative Absolute Values of Cost and Impact for the Measures in Workpackage 6

	Total Cost (Investment and operation)	Net Cost (After revenue / reduced operating costs)	Period	Annualised net cost	Comments	Impacts		
						CO_2 reduction	NOx reduction	PM_{10} reduction
9.1 Car sharing for business and private persons	€1,396,602	€479,649	8 years	€59,956	The organisational set up for the Sunfleet system involved co-ordination of a large number of separate suppliers / subcontractors, with the central function being one of system integration and project management. This could appropriate to a system that has ambition to play a large part in the mobility market of a city, but is unlikely to be cost effective for a smaller scale project.	30.4 tonnes per annum	15.1 kg per annum	0.18 kg per annum
9.2 Development of a car sharing club	€188,254	€138,045	5 years	€27,609	This project was a much smaller scale project based on a transferable UK model that required less up-front investment than the system in Malmö.	120 tonnes per annum	Not assessed	Not assessed
9.3 Development of a car pooling	€56,430	€56,430	7 years	€8,061	Project development was only just completed at the end of the SMLE contract. The car sharing scheme is a smaller intervention than the other measures focused initially only on a small number of employers and so will have a more limited potential impact once it is established and functioning well.	Not assessed	Not assessed	Not assessed

For measure 9.2, the total cost was around €138,000, with relatively high operational costs, but also some income achieved. The total cost of measure 9.3 was around €60K, all of which were set up costs for the operating centre to match car sharers. No income was generated.

As can be seen from table 5.5.2, measure 9.2 was more cost effective than measure 9.1. This may in part be because 9.2 is based on a more developed concept than 9.1 and so required less investment in the core systems. However, another factor is that measure 9.2 appears to have delivered an element of travel behaviour change among its membership that is not reflected in the results for measure 9.1. This suggests that travel behaviour change is more of an influencing factor on environmental impacts rather than continued motorised mobility using clean vehicles.

Table 5.5.2: Cost Effectiveness Summary of the Measures in Workpackage 9

Measure	CO_2	NOx	PM_{10}
9.1 Car sharing for business and private persons	€1975 / tonnes	€3,981 / kg	€33,300 / kg
9.2 Development of a car sharing club	€230 / tonnes	Not assessed	Not assessed
9.3 Development of a car pooling	Not assessed	Not assessed	Not assessed

Transferability

There is good scope for transferring the car club measures. Public, local authority and business concerns about fuel price increases, climate change, congestion and parking problems should help to drive such measures. When transferring the measure elsewhere, planning is required to ensure that car clubs are profitable, sustainable enterprises. This should include consideration of financial and management arrangements, target markets/club locations, partnerships with local workplaces that may benefit from car clubs and arrangements for publicity. As measure 9.1 may be one of the only European car clubs using ‘green’ cars, it may be particularly useful for other cities to learn from this experience.

Measure 9.3 is also likely to be transferable, although there are few lessons to draw on at present as the measure is still being implemented. The transferability assessment for measure 11.4 may be more relevant at this stage to other cities wishing to implement car sharing initiatives, and indeed to the further development of measure 9.3.

Recommendations

For both car clubs and other car sharing initiatives like that covered by measure 9.3, it is recommended that:

- Management and funding arrangements are carefully considered. Good planning and organisation is especially important where work on elements of implementation is subcontracted to external suppliers, e.g. software facilities.
- Market research is undertaken into a) potential target markets and customer needs when setting up car sharing schemes, and b) reasons why people participated, customer satisfaction, and whether and how travel behaviour has changed, once schemes are operational. These strands of research can inform choice of location of car sharing initiatives, a marketing strategy and the further development of existing schemes to help ensure customer satisfaction.
- A comprehensive engagement and marketing strategy should be developed, enabling the benefits of car sharing initiatives to be clearly demonstrated. Local businesses and other organisations that

may benefit from car clubs should be engaged at the earliest opportunity, and arrangements for publicising schemes to members of public should be put in place.

- The scope for linkage with other sustainable transport measures should be considered, either a) promotion of car sharing schemes via measures such as workplace travel plans and individual travel advice and/or b) promotion of initiatives to encourage use of other forms of sustainable transport, as benefits of membership of car club or other car sharing schemes.

5.6 WP10: New Concepts for the Distribution of Goods

New concepts for the distribution of goods.	10.1 Freight Driver Support	Malmö
	10.2 Satellite based traffic management for SMEs	Malmö
	10.3 Development of Strategic Freight Holders Club to Deliver Improved Efficiency of Freight Operation in the City Area and Effect Improved Air Quality in Urban Areas	Norwich
	10.4 Priority access for clean goods vehicles	Norwich
	10.5 Urban freight consolidation centre	Norwich
	10.6 Goods delivery to Park & Ride Sites	Norwich
	10.7 Sustainable SME logistic for the food industry	Malmö

The majority of the measures in this workpackage are aimed at implementing measures that improve the efficiency of freight transport. This can be done directly in two ways – either through better organisation of existing freight transport structures (measures 10.1, 10.2 & 10.4) or through a more fundamental approach by implementing new systems that require freight to be moved using different logistics arrangements (measures 10.5 & 10.7).

Measure 10.6 took a more indirect approach by attempting to change the way in which goods are moved by private individuals after the purchase has been made. The hope was that by providing a system to transport goods away from the store to a collection point at a Park and Ride site then the customer would be willing to leave their cars at Norwich's system to Park and Ride sites and use the bus service to travel into town, rather than bringing their own car all the way into town.

It should also be noted that measures 10.3 and 10.4 were implemented to be support measures for the main freight measure in Norwich – 10.5, the urban freight consolidation centre. Also, measure 12.8 (Customised Traffic and Travel Information Service for Freight Operators), which is included in the telematics workpackage, could just as easily have been included in this workpackage.

Impact and Process

At the basic level it is fair to say that the freight workpackage has been the least effective of the eight workpackages in SMILE. Of the measures implemented only part of measure 10.1 and 10.6 can be said to have had any impact, and in those cases it is relatively small. Perhaps the most disappointing measure is the urban freight consolidation centre in Norwich, partly because it was the most ambitious of SMILE's freight measures and should have had the potential to make a significant difference to the impacts of freight transport to and within the city.

Measures 10.1 and 10.2 have approached the issue of internal efficiency through the implementation of technology measures to improve vehicle management. That will improve the overall utilisation of the vehicle. The technology for measure 10.1 involves an in-cab system that is intended to improve transport planning for the long distance lorry fleet of Malmö LBC by providing real time control of the fleet in relation to the allocation of incoming customer orders. The system is also specified to provide real-time feedback to the drivers about their fuel consumption. This is intended as an ongoing refresher of their previous eco-driving training. Measure 10.2 is similar in focus to the first half of measure 10.1 as it involved the use of a gps system to provide the traffic dispatch team at 215215 Transporter with a better knowledge of where vehicles are located as orders are placed by customers. The anticipated result is to increase efficiency through improved coordination of transportation tasks. It is worth noting that the potential for improvement in coordination is limited to new incoming tasks during the day, since the basic planning is made in advance and since no tool for route optimisation is included in the new system.

In both cases the dynamic scheduling function does not appear to have a distinguishable impact. The implementation of measure 10.2 at 215215 Transporter occurred early in the project and they suggested that it might actually be more suited to an organisation with a more dynamic customer base i.e. one that relied less on a fixed order schedule. The subsequent testing in measure 10.2 at Malmö LBC indicates that their efficiency is highly optimised within the urban area already, which is why they have chosen to use the system only on their long distance / regional fleet. However, the results of small scale tests have led to them not implementing the system more widely, but instead continuing to develop and test two systems with their chosen providers.

The element of measure 10.1 which does show promise is the dynamic fuel consumption feedback which is estimated to have the potential to improve fuel efficiency by 2% over and above the long term effects for drivers that have already received eco-driving training. For application across the whole Malmo LBC fleet this would equate to around 115,000 litres of diesel per year, corresponding to 300 tonnes CO_2 per year, although this is dependent both upon all the drivers having received eco-driving training – a programme that is currently ongoing and which yields a primary impact of around 4.5 times this reduction in fuel use and CO_2 emissions – and all vehicles being equipped with the new equipment, which is neither currently the case (7 test vehicles while the system is being developed) nor the current aspiration – which is 50 vehicles, or one third of the fleet.

The other measure that could improve efficiency of the existing distribution system (although it has actually been implemented in conjunction with the freight consolidation centre in Norwich as a promotional priority tool) is the use of bus lanes for priority goods vehicles. This is a measure that has been proposed for some time in the UK, but in practice in Norwich has been found not to lead to particular benefits in this case. The reasons for this were:

- the main benefits from using an inbound bus lane only occur during the am peak period,
- the Newmarket Road bus lanes are generally 3.0m wide and this does not provide sufficient width for vehicles to overtake cyclists without moving into the outside lane. During the am peak time the outside lane has queued traffic resulting in vehicles staying behind the cyclists' and reducing some of the benefits provided by the bus lane. Similarly HGVs can be delayed by buses waiting at bus stops.
- the length of bus lane that can be used is small when compared to the overall journey length from the consolidation centre to the city centre.

Additionally the use of a bus lane by HGVs has produced some negative reaction, particularly from cycling organisations who believe that it is unsafe for HGVs and cyclists to mix in the bus lane. This was circumvented by restricting the use of the bus lane to a small number of trained drivers operating vehicles on behalf of the freight consolidation centre, but wider application would be likely to lead to a more significant objection and the potential for political pressures to prevent such wider application from occurring.

Of the three measures which involve organising freight transport in different way, only 10.6 using the Park and Ride network as a delivery and collection point for customers had any worthwhile level of use. However, the evaluation showed that the use of the system was only significant in the peak shopping period in the run up to Christmas, and in future this is the period that operation is likely to be limited to. The cost of implementing this measure was surprising, with the majority of the costs being classed as consumables, relating to the crates required for the goods transfer and publicity leaflets for the scheme.

The reorganisation of the process for distribution of locally produced goods in the Malmö area has been shown to have significant potential, but it has proved very difficult to get these small, locally based producers to change their way of working. It appears that because they are producing on a relatively small scale with limited resources it is difficult even for them to interact with external organisations in order to explore this type of potentially beneficial project. The potential benefits of the system have been assessed and shown to be significant, particularly if combined with other best practice measures such as the use of clean fuels and eco-driving. This is, however, a hypothetical situation if membership of the core system cannot be encouraged. Clearly some better way of selling the benefits to these organisations needs to be found.

The approach taken to the freight consolidation centre in Norwich was based on the need to avoid any ongoing operational costs in the post-SMILE period. SMILE contributed largely to the costs of a full time scheme development officer, whose primary role was to contact businesses in receipt of goods within Norwich city centre and explain why using the freight consolidation centre would be beneficial for their business. The logistics base and equipment for the scheme were largely already in existence and provided by the winning tenderer – Foulger Transport Ltd.

In practice it has proved extremely difficult for Foulgers to recruit any businesses to use the freight consolidation centre. It should be noted that there is no compulsion to do so and so far little in the way of access restriction has been used to force the issue. In fact there is some evidence that existing delivery restrictions are not currently being well enforced in the city, which might have helped the recruitment process.

Instead the recruitment process has rested largely on attempts to demonstrate a benefit to retailers on an individual basis, supplemented by the incentive of the priority access to the A11 bus lane. However, it is clear that these processes have not been successful in enticing business to the freight consolidation centre. It is clear that a more significant policy push would be required if the freight consolidation centre is to make any impact on freight deliveries in Norwich.

It is likely that the profile of Foulgers, who are not well known in the national retail distribution market, will not have helped in this situation. This point links in to a key barrier – that the distribution and supply chain decisions that affect retail distribution to stores in Norwich are largely made at locations outside Norwich – either at regional distribution centres and warehouses or at company headquarters. These decisions would be made to respect the legal restrictions in place within the working traffic environment around each store, which places emphasis back on to the local authority if it wishes to encourage uptake of the scheme in the future.

The freight stakeholder group in Norwich was established as a precursor to the freight consolidation centre in Norwich, and was not well supported by the intended stakeholder groups, even when the decision was taken to shift from face-to-face meeting to an on-line forum.

In recent years several examples of well organised and supported freight quality partnerships have been established in the UK and elsewhere that have overcome the barrier of low engagement by linking in to actions that are seen as directly relevant to the potential stakeholder group, and it is recommended that the basis of the forum in Norwich be reviewed in that light.

Cost Effectiveness

Total costs for the measures as implemented in SMILE workpackage 10 are shown in Table 5.6.1.

Some limited cost effectiveness data has been derived for these measures, although this is limited due to the lack of success of many of the measures. These cost effectiveness values are shown in Table 5.6.2.

Table 5.6.1: Indicative Absolute Values of Cost and Impact for the Measures in Workpackage 10

	Total Cost (Investment and operation)	Net Cost (After revenue / reduced operating costs)	Period	Annualised net cost	Comments	Impacts		
						CO_2 reduction	NOx reduction	PM_{10} reduction
10.1 Freight Driver Support	€793,318	€234,778	20 years	€11,739		100 tonnes per annum	Not assessed	Not assessed
10.2 Satellite based traffic management for SMEs	€152,960	€54,134	5 years	€10,827		Not assessed	Not assessed	Not assessed
10.3 Development of Strategic Freight Holders Club	€18,357	€18,357	4 years	€4,589		Not assessed	Not assessed	Not assessed
10.4 Priority access for clean goods vehicles	€55,664	€55,664	7 years	€7,952		0.027 tonnes per annum	0.142 kg per annum	0.011 kg per annum
10.5 Urban freight consolidation centre	€212,310	€212,310	2.33 years	€91,120		1.36 tonnes per annum	7.81 kg per annum	0.062 kg per annum
10.6 Goods delivery to Park & Ride Sites	€207,108	€207,108	6 years	€34,518		Not assessed	Not assessed	Not assessed
10.7 Sustainable SME logistic for the food industry	€164,343	€164,343	4 years	€41,086		2 tonnes per annum	Not assessed	Not assessed

Table 5.6.2: Cost Effectiveness Summary of the Measures in Workpackage 10

Measure	CO_2	NOx	PM_{10}
10.1 Freight Driver Support	€117.4 / tonne	Not assessed	Not assessed
10.2 Satellite based traffic management for SMEs	Not assessed	Not assessed	Not assessed
10.3 Development of Strategic Freight Holders Club	Not assessed	Not assessed	Not assessed
10.4 Priority access for clean goods vehicles	€294,520 / tonne	€56,000 / kg	€722,910 / kg
10.5 Urban freight consolidation centre	€67,020 / tonne	€11,674 / kg	€1,474,000 / kg
10.6 Goods delivery to Park & Ride Sites	Not assessed	Not assessed	Not assessed
10.7 Sustainable SME logistic for the food industry	€20,543 / tonne	Not assessed	Not assessed

Table 5.6.2 shows that only the in-cab freight driver support tool shows any reasonable level of cost effectiveness among the freight measures, and that is effectively a secondary measure to support the initial eco-driving training action.

Upscaling

The potential for upscaling of the freight measures is on the whole quite limited.

Measure 10.1, the freight driver support system, does offer potential for upscaling as it is currently only deployed on 7 test vehicles for system development works, whereas Malmö LBC does have as an aspiration implementation on 50 vehicles i.e. one third of its fleet and beyond that there are other vehicles in the Malmö LBC fleet and then vehicles operated by other hauliers in the Malmö region.

Measure 10.2 is in some ways a scaled down version of measure 10.1, and as it does not offer the in-cab support to reinforce the previous eco-driving training it does not appear to offer the same benefit was measure 10.1.

Measures 10.3 and 10.4 have not shown their worth in the current form. A freight stakeholder forum would have merit if run in the appropriate way. Measure 10.5 is largely a one-off measure for Norwich that would not be upscaled, except in the sense of encouraging participation to the existing scheme.

The situation is similar for measure 10.7 which has set up a one-off measure which needs to benefit from significantly higher uptake from the target audience before further widening of its scope.

Measure 10.6 has shown itself to work best as a limited application in selected locations and for the limited peak shopping period in the run up to Christmas. Any upscaling would be linked to improving scheme uptake through better promotion.

Transferability

In the same way as the potential for upscaling the freight measures is limited, so the potential for transferability in their current form is limited, given the poor cost effectiveness results. Instead effort should be focused on improving the effectiveness of the existing measures (see recommendations section) prior to revisiting the idea of transferability at a later date.

Recommendations

When investing in information technology solutions designed to improve the efficiency of existing distribution mechanisms, make sure the goals reflect the efficiency gains that the organization expects from the vehicle computers: mainly reduced administrative costs and reduced unloaded kilometres. These goals should be made measurable and formalized from the very beginning of the process and there needs to be a clear action plan that describes how goals and results are to be materialized, what actions are to be taken and when. There is a critical need to show results of the measure, in order not to lose the vehicle-owners confidence in the system. For example, if baseline data unloaded kilometres is lacking at the start then there is a need to figure out how to make follow-up on this variable.

The roles and responsibilities should be clearly defined, in terms of the role and responsibility of the supplier versus the customer, in driving the innovation process, particularly as it is the vehicle owner / operator who will see the long term benefit.

A training and education program for all drivers, as well as administrative staff, should be run as soon as the vehicle computers are installed to avoid distrust and frustration which might jeopardize their acceptance altogether.

It is recommended to develop a fuller evaluation process and methodology to collect a quality dataset based on a larger sample of data over a longer time period so that the wider environmental and economic benefits and success of the measure can be established.

For the eco driving support function of the in-cab device, it is recommended to encourage drivers who have participated in the heavy eco driving training programme to continue to practice the learned technique whilst this measure is being implemented, which will yield additional financial and environmental benefits in terms of reduction in vehicle emissions. Also, it is worth encouraging trained drivers to attend refresher sessions to maintain and expand the knowledge of eco driving and recruiting new drivers to take up the training in heavy eco driving to maximise potential environmental benefits.

Freight Quality Partnerships (FQPs) provide an opportunity for relevant and interested authorities, businesses and interest groups to come together and engage in useful dialogue with a view to investigating and addressing the specific issues that need to be addressed as a result of freight distribution. In order to achieve engagement and deliver a successful outcome FQPs need to be properly resourced and to be linked with practical projects relevant to all potential stakeholder groups. When setting up an FQP a more effective research and development phase as part of the initial engagement, starting with the trade organisations that are paid to represent individual members would be appropriate to set an agenda of mutual interest. This would allow an understanding of the day-to-day interests of the freight industry and how these can be addressed in conjunction with the more strategic aspirations of the public authorities, rather than focusing solely on the latter.

Regarding the use of bus lanes by HGVs, this is likely to lead to an uneasy relationship with cyclists and cyclist organisations. In order to make this interaction work well it would be important to review the technical specification of bus lane provision so that the space available is wide enough to allow easy co-existence between cyclists and essential large vehicles to which priority might be offered. A controlled access solution would be ideal, which should include training of a restricted set of drivers and also the use of specific safety devices such as Fresnel lenses in order to minimise the risk of accidents.

In relation to the freight consolidation centre, greater incentive is required to encourage use of the consolidation centre. In particular, more control of freight movement within Norwich City centre through stricter restrictions on freight traffic and stricter enforcement would be required in order to drive participation in the consolidation centre.

Use of support mechanisms such as delivery and servicing plans through the development control process could be use to mandate future use of the freight consolidation centre in conjunction with developers and building owners.

An operator that is better integrated with existing retail operations within Norwich city centre and with other consolidation centres within the UK might have had more success in recruiting participants. Forging operational links at the national level both with existing retail logistics operations and other consolidation centres might prove beneficial.

Implementation of a ‘Shop & Go’ service would be possible in other cities with Park & Ride, or who have an edge of city, staffed car park where goods can be left for collection by customers. Variations of this service could be offered involving customer collection of goods at bus or rail stations. This should encourage use of other transport modes, although security precautions at stations would need careful consideration. Locally, the delivery service should not be made available before 12pm, as an insufficient quantity of goods are purchased in the morning period. Timing of purchases may vary in other cities, and data on this may need collecting. However, it will still be the case that a sufficient number of purchased goods would need building up at drop off/subsequent collection points from when retailers open each day, in order for the delivery service to be viable. Ensure that all drop off/subsequent collection points accept goods from all stores, otherwise these points will be under used.

Priority number one when choosing the technical solution for the co-ordination of freight transport for regional food transport should be the end-user. That is, the web tool has to be user-friendly rather than complex. Otherwise the initial barrier might be too high for the potential user. For farmers that want to participate in the system but who lack IT skills/resources/interest/competence consider establishing a system whereby the farmer can complete and submit a paper form with information about produce available to a central service which then types this information into the web tool on behalf of the farmer. Another potential option is to permit farmers to SMS/text message information to a central service and then receive requests via SMS by mobile phone. This attention to the needs and interests of the producer end-user is important.

The target groups are so disparate that there will be a clear need for central co-ordination of a plan and resources in order for the measure to succeed. This is probably a role for a local authority or development agency. Use committed staff members with the right skills. It is of utmost importance that skills involving coordination/administration as well as marketing are represented among the staff members, because initial efforts put on a well-planned marketing and communication strategy are fundamental. For example, take into consideration that a majority of small-scale food producers are unavailable during their high season. Try to make contact and build networks during winter season (October-March). Do not use e-mail or IT in any form when initiating contacts with producers (and purchasers).

To make the best impact consider, when contracting a logistics partner for the system, the use of clean fuels (biogas), educated drivers (eco-driving), and skills within the fields of optimised routes and logistics as part of the selection criteria.

Regarding evaluation, early on, plan and conduct a baseline study which can give answers to fundamental questions about preferences among stakeholders, demand and supply structures, and product flow patterns.

5.7 WP11: Soft Measures

Innovative 'soft' measures for managing mobility demand.	11.1 Managing mobility needs of private persons and business sector	Malmö
	11.2 Eco-driving for municipal employees	Malmö
	11.3 Travel Planning	Norwich
	11.4 Car-pooling	Norwich
	11.5 Individual travel advice	Norwich
	11.6 Mobility centre	Potenza
	11.7 Information and awareness	Suceava
	11.8 Eco-driving for hospital employees	Malmö
	11.9 Heavy eco-driving	Malmö

Impact and process

This work package incorporated a range of measures, although there is some overlap between them; for example the travel planning measure involves information and awareness campaigns, one of the services adopted by the mobility centre was car pooling.

Three measures, 11.2, 11.8 and 11.9, provided eco-driving training to different groups of people, all in Malmo. The scale of the training for each measure was:

- 11.2 - around 1000 municipal employees received training during a period of over 24 months
- 11.8 - 100 hospital employees received training over 10 months
- 11.9 - 139 HGV drivers received training over 14 months.

All three measures resulted in reductions in CO_2 emissions and fuel consumption, although these were less than originally hoped. The heavy eco-driving training had the most impact in terms of CO_2 emissions and fuel consumption reductions. For both the municipal and hospital employees measures, there were problems in getting people to participate; this seems to have arisen from managers finding it difficult to identify time for staff to undertake training. This was not an issue regarding training of drivers from the commercial sector, particularly as a clear economic benefit of decreased fuel consumption was demonstrated to transportation companies all the measures highlighted that active steps need taking to maintain the impacts of eco-driving training longer term, e.g. provision of refresher training.

The Norwich based measure 11.4 established car pooling schemes available to workplaces, schools and individual members of the public. It led to savings in CO_2 emissions, fuel consumption and distance travelled. The measure also resulted in modal shift, with 76% of workplace car sharers previously travelling in single occupancy cars. Measure 11.4 was delivered in conjunction with the Norwich travel planning measure (11.3) and promotion of car pooling alongside other sustainable transport options helped drive the measure. It was also promoted via the Norwich individual travel advice scheme (11.5).

Measures 11.1, 11.3 and 11.6 were similar in that they were relatively large scale and implemented packages of sustainable transport initiatives at an organisational level - a mobility centre with four offices in the main workplaces in Potenza (11.6), mobility management in Malmo (11.1), aimed at influencing local companies but also members of the public, and travel plans for workplaces and schools in the Norwich area (11.3).

Looking at the impact of these measures:

- the main outcome of measure 11.6 was the establishment of the mobility centre. There were delays in implementing sustainable transport initiatives subsequently, so further impact was limited, although information campaigns were held on public transport use
- the various activities implemented by measure 11.1 generally fulfilled their objectives, although their success varied. This was influenced by the original ambition level and nature of the campaign design. Awareness of a typical campaign may lie at around 20% of the population. Because of the diversity of the campaigns, it was not possible to estimate CO_2 emission reductions for all campaigns nor to extrapolate to the whole measure. The measure contributed to modal shift towards bus travel
- measure 11.3 appears to have had the largest direct impact, with a high number of organisations being aware of the measure and submitting travel plans. The school travel plans resulted in CO_2 emission and fuel consumption savings. They exceeded the target for modal shift, delivering a 10.9% reduction in single occupancy car use. Less data were available to evaluate the workplace travel plans, but 4 organisations showed a 10.75% decrease in single occupancy car use. Key drivers were: the availability of dedicated travel plan staff, both within the local authority supporting development and implementation of travel plans, and co-ordinators within the organisations adopting plans; and use of a standard staff travel survey, providing baseline data to facilitate development of travel plans, and helping to engage staff in this process.

Measure 11.7 in Suceava raised awareness of and disseminated information about sustainable travel, through marketing campaigns aimed at educational establishments and workplaces, and the general public. In Norwich, measure 11.5 provided information about sustainable transport options through a personalised advice service. This was offered to individuals at a university and in a residential area. (Measure 11.1 also incorporated an individual advice element, via a web page that could be personalised in order to receive tailored information and guidance).

There was a high level of awareness and acceptance of measure 11.7, and evidence of modal shift, with occupancy of public transport vehicles increasing threefold from 2005 to 2008. For measure 11.5, most participants in the individual travel advice scheme found it useful; the university intervention resulted in a 1% shift way from car use and a 6% increase in car sharing, but no change to the use of public transport; participants in the residential scheme had increased awareness of different forms of sustainable transport, but their travel behaviour mostly remained unchanged.

The primary focus of the impact assessment of the measures in workpackage 11 has been in terms of CO_2 emission reductions because this is the area where changes in travel behaviour rather than technology investment are most likely to be felt. Significant reductions in CO_2 emissions have been produced by several of the measures, as shown in table 5.7.1. Note that the data in table 5.7.1 underestimate the impact of measure 11.1 because the quantified evaluation was only conducted on two of the most clearly identified campaigns to provide an example of the impacts of this type of measure.

Upscaling

As noted in the Malmo and Norwich sections of chapter 4, mobility management (11.1) and travel planning (11.3) can be used as overarching measures, which provide a strategy to support development of other innovative ‘soft’ measures. There is good potential for making further links between other measures, and between these and measures in some other WPs, as a means of reinforcement. For instance car sharing can be promoted through personal travel advice, eco-driving training could be associated with car clubs (WP9) and low emission zones (WP6).

There is an opportunity for measure 11.1 to be extended to other nearby cities and towns, and to make some of the measure initiatives permanent. The measure leader notes that this is subject to political approval, but may be driven by increasing concerns amongst policy makers to reduce greenhouse gas emissions and pollution from transport. For measure 11.6, (mobility centre), it seems that further implementation and evaluation of measure activities will need to take place before the upscaling potential can be fully assessed. There are opportunities to integrate this measure with related strategies such as the local area plan.

With measure 11.3, travel planning, the following significant opportunities exist:

- creating networks of similar organisations with travel plans, e.g. schools or businesses within a retail park, to share advice and best practice, and run joint initiatives and events
- travel plans have be produced as a planning condition of new residential developments.

There is potential to expand the individual travel advice measure (11.5) to other workplaces or residential areas. However, this service is resource intensive, so adequate funds and staffing would need to be identified. If this is prohibitive, the service could be extended in a more limited form, for example perhaps a personalised web page facility similar to that offered as part of measure 11.1, mobility management. Alternatively more general information campaigns could be run without the personalised element, like those in measure 11.7.

With regard to car pooling (measure 11.4), there is scope to set up schemes in more organisations. Evidence from the SMILE evaluation can be used to develop a business case to promote to these organisations, with greater emphasis being placed on the financial savings that can be achieved.

To ensure reasonable rates of take up eco-driving training, the barrier of lack of time for staff to attend training must be tackled. (This might well be a problem in other cities.) Possibly this could be achieved by offering eco-driving training as part of a wider training package or in conjunction with a number of workplaces as a city-wide effort. As mentioned above, eco-driving training could be provided as a benefit of, or a criterion for participation in other sustainable transport measures. Subsequently, it will be important to maintain the benefits accrued from eco-driving training in the long term, e.g. by monitoring individual drivers' performance and providing feedback, and/or offering refresher sessions.

Cost Effectiveness

The total cost of measures 11.2 and 11.8, eco driving training for municipal and hospital employees respectively were around €266,000 and €21,000 respectively. These costs reflect the larger scale on which measure 11.2 was implemented within the municipality and also the greater difficulty in getting managers to release staff from their regular jobs in comparison with the hospital where for many of those who were trained driving was a core part of their job. Neither measure 11.2 nor measure 11.8 is shown as generating any income/reduced costs. This is because of the difficulty of internalising these for the two institutions concerned. In practice there will have been a reduced fuel cost, but it has not been identified as a tangible benefit within either organisation. In contrast, the heavy eco-driving training (measure 11.9) generated a significant amount of reduced fuel costs that have been identified as a direct benefit to the vehicle operator, so that a net profit was made, of about €518,000 to go with the reduction in CO_2 emissions. The high distances travelled and high specific fuel consumption of HGVs contributed to this result.

Measure 11.4, car pooling, had a total cost around €100,000, largely consisting of set up costs, with no direct income recorded. However, this cost balance is again affected by lack of internalisation of the fuel cost savings. The measure evaluation template rightly points out that a benefit in terms of reduced cost saving to the end users, i.e. the individual participants in the scheme, would be saving around €400,000 per year in fuel costs.

Measure 11.1, mobility management, had a very high total cost in the region of €2.2-2.3M reflecting the significant effort that was put into a range of travel awareness and behaviour change campaigns in Malmo. The individual campaigns had a wide range of individual budgets associated with them ranging from around €10,000 for smaller or pilot actions to over €100000 for some of the larger interventions. The evaluation of impacts was focused on two of the most easily contained campaigns in order to try to reduce the effect of external influences. The total cost of measure 11.3, travel planning in Norwich was also relatively high at €372,000, but this covered around 100 individual interventions, mainly with schools but also with some businesses to support workplace travel plans. As previously noted these types of measures can act as a strategic driver for other related measures. Moreover, 11.1 has added value in that it contributed significantly to changing the policy framework of the local authority in Malmo. That is, through a much greater emphasis on 'soft' sustainable transport measures, and enhanced understanding of the relationship between soft and hard measures (see section 4.1.6).

Table 5.7.1: Indicative Absolute Values of Cost and Impact for the Measures in Workpackage 11

	Total Cost (Investment and operation)	Net Cost (After revenue / reduced operating costs)	Period	Annualised net cost	Comments	Impacts		
						CO_2 reduction	NOx reduction	PM_{10} reduction
11.1 Managing mobility needs of private persons and business sector	€2,200,000 - €2,300,000	€2,200,000 - €2,300,000	4 years	€550,000 - €575,000	Full costs cover a wide range of different individual campaigns and also the co-ordination of a much increased programme of travel awareness campaigning in Malmö that resulted in a significantly raised profile for the issue in the city.	26.6 tonnes & 73.0 – 133.4 tonnes (partial assessment: i.e. of 2 individual campaigns)	Not assessed	Not assessed
11.2 Eco-driving for municipal employees	€237,575	€237,575	3 years	€79,192	Significant staff cost invested in motivating staff and their managers to participate. It was not directly possible for staff / managers to see the monetary benefits of the training – namely fuel cost savings. Nor were there any follow up sessions, so that it is expected that the effects will decrease quite sharply	9.36 tonnes	2.4 kg	0.25 kg
11.3 Travel Planning	€371,946	€371,946	6 years	€61,991	The costs associated with travel planning in Norwich were extensive, but have contributed to a significant change in culture with respect to sustainable travel initiatives within the local authorities. The school travel planning initiatives are now seen as some of the best in the UK. The costs are written down over 6 years because there is likely to be a diminishing residual effect after this type of initiative prior to a renewed intervention.	1134 tonnes per annum (partial assessment covering school travel plans only)	Not assessed	Not assessed

	Total Cost (Investment and operation)	Net Cost (After revenue / reduced operating costs)	Period	Annualised net cost	Comments	Impacts		
						CO_2 reduction	NOx reduction	PM_{10} reduction
11.4 Car-pooling	€102,391	€102,391	6 years	€17,065	As for the individual travel plans, the car pooling service has performed well. The costs and benefits in the table are those attributed to the formal SMILE project partner organisations. However, the fuel cost savings to users of the scheme would outweigh the scheme set up costs by a factor of 3 times if they were included in the analysis.	371 tonnes per annum	Not assessed	Not assessed
11.5 Individual travel advice	€262,192	€262,192	6 years	€43,699	The various individual interventions in Norwich have proved costly, but not as effective as elsewhere in the UK in driving a change in travel behaviour, and an investigation is underway as to the reason for this. For example, were the people areas targeted already travelling by sustainable means more than average leaving less room for a change in behaviour through marketing and information alone?	Minimal impact	Minimal impact	Minimal impact
11.7 Information and awareness	€95,962	€95,962	6 years	€15,994	This measure has involved institutional and general public awareness raising exercises and as such is seen more as a support measure for the other elements in Suceava rather than a direct behavioural change mechanism in its own right.	Not assessed	Not assessed	Not assessed

	Total Cost (Investment and operation)	Net Cost (After revenue / reduced operating costs)	Period	Annualised net cost	Comments	Impacts		
						CO_2 reduction	NOx reduction	PM10 reduction
11.8 Eco-driving for hospital employees	€19,134	€19,134	3 years	€11,351	As for measure 11.2 it was not directly possible for staff / managers to see the monetary benefits of the training – namely fuel cost savings. Nor were there any incentive packages put in place to reinforce the training, so that it is expected that the effects will decrease quite sharply.	4.3 tonnes per annum	0.09 kg per annum	0.009 kg per annum
11.9 Heavy eco-driving	€115,002	-€458,196	4 years	-€114,549		633.5 tonnes per annum	Not assessed	Not assessed

Table 5.7.2: Cost Effectiveness Summary of the Measures in Workpackage 11

Measure	CO_2	NOx	PM10
11.1 Managing mobility needs of private persons and business sector	€283 – 1,556 / tonnes CO_2	Not assessed	Not assessed
11.2 Eco-driving for municipal employees	€25,382 / tonnes CO_2	€99,900 / kg	€935,000 / kg
11.3 Travel Planning	€45 / tonnes CO_2	Not assessed	Not assessed
11.4 Car-pooling	€46 / tonnes CO_2	Not assessed	Not assessed
11.5 Individual travel advice	Not assessed	Not assessed	Not assessed
11.7 Information and awareness	Not assessed	Not assessed	Not assessed
11.8 Eco-driving for hospital employees	€1,487 / tonnes CO_2	€71,100 / kg	€711,000 / kg
11.9 Heavy eco-driving	-€180.8 / tonnes CO_2	Not assessed	Not assessed

The measure that stands out within table 5.7.2 is the heavy eco-driving because of the ease with which the cost benefits of the measure could be internalised, leading to a net cost saving and a sizeable reduction in CO_2 emissions. However, the other eco-driving measures might have performed better in this respect if the fuel cost savings could have been factored in and also if a long term programme of driver incentives or re-training had been implemented. Note also that measure 11.9 could be supplemented by the vehicle computers in measure 10.1 to provide further fuel and CO_2 savings.

Of the other measures, the car pooling in Norwich has been successful in generating a large number of users and this provides a better scope for journey matching, leading to larger benefits. If the cost savings of the individual users were included in the calculation of the scheme costs then the resulting cost effectiveness values would be similar to the heavy eco-driving measure.

The net cost effectiveness of the travel planning measures and the associated emissions reductions are also significant and provide ample justification for the scale of the investment.

Transferability

This work package has demonstrated that a range of innovative 'soft' sustainable transport initiatives can be implemented successfully. Which specific measures should be promoted in different cities and their level of success will depend to some extent on local circumstances. However, given the connections that can be identified between different measures in WP11, there is scope to share across cities the lessons learnt from implementation and evaluation. Cities considering implementation of new measures could take account of these, and so could existing, but less developed SMILE measures - for instance there is potential for measure 11.6, mobility centre, to learn from the experiences of the mobility management and travel planning measures (11.1 and 11.3), and the results from measure 11.4, car pooling, have relevance to the more limited measure 9.3, also concerned with car pooling.

Recommendations

- Specific cities can use overarching measures such as 11.1, mobility management, and 11.3, travel planning, to provide a strategic context for and aid the delivery of other 'soft' measures, and help ensure a co-ordinated approach to promoting measures relating to different sustainable transport modes. Cities should also consider the potential for interactions between other soft measures.

- The delivery of 'soft' sustainable transport measures should be co-ordinated with other relevant strategies, e.g. relating to health promotion or positive activities for young people (see also engagement below).
- Realistic goals should be set for individual sustainable transport campaigns, informed by evaluation of SMILE measures where appropriate. However, this may require further local research, into potential target markets.
- For measures to be implemented at organisational level, it is crucial to secure within organisations a) adequate management support and b) staff time to help deliver measures. This may involve making a convincing business case, drawing on examples of benefits realised from SMILE initiatives.
- A comprehensive engagement and marketing strategy should be developed for each measure:
  - capitalise on current public/organisational concerns about climate change, congestion, the difficult economic situation and health (linking to other strategies where relevant)
  - work with interested local stakeholders, e.g. local bus operators may be able to supply discounted travel tickets as part of initiatives to promote public transport use
  - liaise with the local media, as their support can be useful to promote 'soft' measures.
- The impact of individual measures should continue to be evaluated. For example, it may be important to determine whether modal shift to one form of more sustainable transport is at expense of another, such as increased car sharing detracting from walking or public transport use.
- For measures aimed at providing eco-driving training for employees in the public sector, ensure that :
  - staff have time to attend training
  - the effects of training are maintained.

5.8 WP12: Telematics

Telematics	12.1 Use of real time applications for traveller services	Malmö
	12.2 Traffic monitoring	Malmö
	12.3 Mobile internet services in connection to bus information	Malmö
	12.4 Internet tool for traffic planning	Malmö
	12.5 Public transport priority system	Tallinn
	12.6 Automatic stop calls and information-signs in public transport vehicles[16]	Tallinn
	12.7 Bus priority system	Malmö
	12.8 Customised traffic and travel information service for freight operators	Norwich
	12.9 Provision of real time passenger information	Norwich

Impact and Process

Four of these measures involved prioritising sustainable transport movements. Measure 12.2 installed a traffic signal control system at 10 signals in Malmö, to give priority to public transport, cyclists and

[16] In Tallinn there are three types of public transport vehicles: buses, trolleybuses and trams

pedestrians. Measure 12.7 was also based in Malmö and involved prioritising buses specifically. Priority systems were implemented at 42 intersections. In Tallinn, measure 12.5 operated at a more basic level, i.e. upgrading infrastructure, to give priority to public transport. It was linked with measure 12.6, which provided automatic stop calls and information signs in public transport vehicles.

Measure 12.2 had no impact in terms of reducing public transport journey time, speed, fuel consumption or exhaust emissions. However, during evaluation, the traffic signal control system was found to be not always functioning properly. The measure leader also noted that technical problems may have been experienced with the system and it may reach an optimum state of operation after the SMILE evaluation period after a further period of technical testing and optimisation. Measure 12.7 did not suffer from technical issues and had more impact in Malmö, by increasing bus speed and punctuality. Measures 12.5 and 12.6 were evaluated together because many of the impacts were difficult to separate. Speed of trolleybuses increased whilst speed of cars decreased. The previous trend of modal shift away from public transport was halted, although there was no reversal leading to an increase in its use. The most significant result is the increased level of user satisfaction with public transport information.

Three measures were concerned with providing real time information to bus passengers. In Malmö, measure 12.1 involved installation of a total of 61 information displays at bus stops, shopping centres and other strategic positions, while in measure 12.3 a mobile phone-based information service was implemented. In Norwich, measure 12.9 supplied information via mobile phone, internet, and display screens hosted by local bus operators and at public access locations, although the measure was trialled on a small scale.

Within measure 12.1, the real time signs helped increase the number of passenger journeys and were considered easy to understand by most users surveyed. The mobile phone service, measure 12.3, also increased the number of passenger journeys but to a lesser extent. This may be due to awareness of the service being much higher than its use. In turn this may reflect the fact that the measure depends on access to a mobile, and the knowledge to install and use the service. Nevertheless, nearly one quarter of users surveyed thought that the service resulted in higher quality travel. Whilst measure 12.9 provided information in several ways, it had less impact than 12.1 and 12.3, mainly due the small scale of implementation and associated technical problems. There is strong evidence from qualitative feedback on the trial that the public and other stakeholders want the measure to be developed further.

In Malmö, measure 12.4 extended a web-based journey planner to incorporate cycling as a travel option. The impact of measure 12.4 was limited, partly due to a delay in measure implementation and reluctance to publicise the development either for testing or once completed.

Measure 12.8 provided customised traffic and travel information to freight operators in Norwich. Initially it was intended to see if this would encourage operators to use cleaner vehicles, but the cost of the latter wad considered prohibitive. Instead users had to undertake eco-driving training. This measure operated on a very small scale, being trialled with two companies. Evaluation focussed on obtaining feedback on use of a web-based information viewer and suggestions for improvements. The results showed that travel information can be helpful during as well as when planning deliveries, there would be increased benefit if this information was supported by other related information and provision of travel information did not give sufficient incentive for freight operators to adopt cleaner vehicles.

Upscaling

It will first be necessary to undertake further evaluation of measure 12.2, traffic monitoring, when the system is properly working. Subsequently the results could inform upscaling. With regard to measure 12.7, bus priority system, the scope for upscaling in Malmö itself may be limited. This is because not all intersections are suitable for system installation. At some intersections traffic flows are too low, and others have conflicting interests with other buses and bicycle movements. In Tallinn, there is potential to expand the public transport priority system (measure 12.5) to all main access routes.

However, this will depend on securing significant amounts of additional funding. It is encouraging that the complementary measure 12.6, automatic stop calls and information signs in public transport vehicles, has already been applied to most of the city's fleet. It is intended to equip any new vehicles with these facilities, although the measure leader notes there may be compatibility issues.

Potentially the real time information displays of measure 12.1 could be installed at every bus stop in Malmo. However, there would probably be diminishing returns at some of the lesser used stops. For measure 12.3, mobile phone bus information service, the leader recommends further evaluation. This would enable a better understanding of the measure's performance, and inform its future development and wider geographical application in the Malmö area. If the service is extended, it may be worth running a PR campaign on how to use it. The evaluation results from measure 12.9 could be used to scope further development and expansion of real time information systems in Norfolk.

It is hard to assess the opportunity for upscaling measure 12.4 (incorporation of cycling in internet journey planner), due to the delay in implementation. The measure leader notes further evaluation will be required.

For measure 12.8, information for freight operators, potential exists to extend a) the information service to other companies and b) the range of information provided, taking account of feedback from companies. Whilst operators did not adopt clean urban principles in return for using the service, there may be scope for getting users to be more sustainable. It could be explored whether this could be achieved through increased interaction between this measure and priority access for clean goods vehicles (measure 10.4) or other recognition and reward schemes of direct relevance to freight operators, i.e. offering a package of benefits to freight companies.

Costs

The costs of the measures in workpackage 12 are significant due to the need for investment in equipment and infrastructure.

Table 5.8.1: Indicative Absolute Values of Cost for the Measures in Workpackage 12

	Total Cost (Investment and operation)	Net Cost (After revenue / reduced operating costs)	Period	Annualised net cost	Comments
12.1 Use of real time applications for traveller services	€832,600	€832,600	4 years	-€208,150	The total cost of measure 12.1 was around €918K, although the evaluation indicated that 'willingness to pay' was high amongst users surveyed, i.e. installation costs could be passed onto users through ticket prices
12.2 Traffic monitoring	€624,937	€624,937	14 years	€44,638	Dominant costs are for infrastructure and sub contractors who installed equipment.
12.3 Mobile internet services in connection to bus information	€1,027,911	€1,027,911	5 years	€205,582	Costs are mainly subcontractor costs linked to system development and then staff costs for linking to existing public transport data systems.
12.4 Internet tool for traffic planning	€100,611	€100,611	10 years	€10,061	Costs are mainly subcontractor costs linked to system development and then staff costs for linking to existing

	Total Cost (Investment and operation)	Net Cost (After revenue / reduced operating costs)	Period	Annualised net cost	Comments
					information systems.
12.5 Public transport priority system and 12.6 Automatic stop calls and information-signs in public transport vehicles	€6,495,823	€6,495,823	12 years	€541,319	Total costs of these measures were the highest of any SMILE measure, with an initial cost of €6m and then ongoing operational costs of around €100,000 per year.
12.7 Bus priority system	€372,227	€372,227	14 years	€26,588	Costs are mainly subcontractor costs and equipment / infrastructure installation followed by an allowance for ongoing maintenance and system upgrades.
12.8 Customised traffic and travel information service for freight operators	€46,644	€46,644	7 years	€6,663	This measure had relatively low costs because the decision was taken to use existing information sources rather than set up new systems and was trialed on a very restricted basis as a test of concept. The measure leader indicated that currently operators are not willing to pay for the service.
12.9 Provision of real time passenger information	€134,860	€134,860	6 years	€22,477	Costs are mainly staff costs associated with trying to overcome barriers to access existing data and then subcontractor costs related to implementing the solution that was finally agreed.

Transferability

There is potential to transfer the measures in WP12, given the move towards information-based societies and increased public expectations for information to be immediately and universally available. However, such measures can be intensive in terms of technical requirements. Cities elsewhere contemplating telematics measures could benefit from the experience and advice of the WP12 measures on technical requirements and compatibility issues, including problems encountered and how these were addressed, and information on subcontractors. Other cities may also be interested in any cost effectiveness data obtained from further monitoring of the WP12 measures, given that no such data exists at present and the measures tend to be expensive to implement.

The public transport priority measures have scope for transferability. However, measure 12.2, traffic monitoring, could learn from implementation of traffic signal control systems in a number of other European cities (a reversal of the SMILE transferability process).

Regarding inter-measure collaboration:

- staff involved in the group of public transport priority measures (12.2, 12.5 and 12.7) could liaise to determine if there are any principles/practices from the individual measures that could be usefully transferred amongst each other
- a similar exchange between measure 12.9 and the Malmö based real time information measures (12.1 and 12.3) could be useful
- a similar exchange between the Norwich based measures 12.9 and 12.8 (information for freight companies) could be useful.

Recommendations

- It may be beneficial to develop telematics measures as part of wider transport information strategies. In such cases there is a missed opportunity in installing traffic management measures at a partial scale where their effects do not reach critical mass within the whole city as it functions.
- There should be thorough scoping of the technical requirements for telematics measures. Where technical work is subcontracted, contracting organisations should ensure they are properly prepared for the procedures that this will entail, and allow for this in their implementation timetables. They will also need to have an appropriate level of in-house knowledge, to ensure the right technical specification in tenders and to judge potential subcontractors' expertise.
- Investigate opportunities for funding/partnerships, to support development and maintenance of new measures, and to support further development and maintenance of existing measures. This could include consideration of users' 'willingness to pay', and whether this could be encouraged by linking with other sustainable transport measures, in order to provide a package of user benefits.
- Some existing measures require further evaluation, specifically 12.2, 12.3, 12.4, 12.7, and 12.8 (assessment of eco-driving training component). For all existing measures, an assessment of cost effectiveness should be made; this could be connected to 'willingness to pay' research in some cases.

5.9 Conclusions

The analysis of the measures on a workpackage by workpackage basis has highlighted some interesting and relevant findings. In particular it can be seen that most of the clean vehicle and fuel measures have been successful in delivering emissions reductions both in terms of greenhouse gas reductions and local air pollutants. Similarly the behavioural change measures have generally been successful in achieving substantial changes in behaviour, with the resulting greenhouse gas reductions being easier to identify (due to their direct link to fuel use) rather than direct local pollutant / air quality impacts.

There is historically a balance to be struck between those measures that influence local air quality and those that have an impact on greenhouse gas emissions. The subsequent analysis is conducted on this basis, looking at the biggest contributors of the SMILE measures to different types of emissions reduction and then assessing the cost effectiveness of these measures.

Based on the evaluation of the measures as implemented in SMILE, the five measures that appear to have contributed most to reducing CO_2 emissions are:

- Measure 11.3, travel planning in Norwich, which delivered annual reductions of 1134 tonnes CO_2;
- Measure 5.2, biogas on the net in Malmö, which delivered annual reductions of 431 tonnes CO_2 within the project period, but has inherent capacity to increase this to 1121 tonnes CO_2 per annum;
- Measure 11.9, heavy eco-driving in Malmö, which delivered annual reductions of 634 tonnes CO_2;
- Measure 5.4, sustainable biodiesel supply chain in Norwich which will deliver annual reductions of around 600 tonnes CO_2 in the Anglian Bus fleet;
- Measure 7.2, influencing the choice of vehicle towards smaller and more fuel efficient vehicles in Norwich, which is a long term policy measure with the potential to reduce annual CO_2 emissions by anywhere between 300 tonnes on a cautious scenario and 2742 tonnes on an optimistic scenario.

It is interesting to see a mixture of technology, policy and behavioural change measures present within the list.

Clearly this needs to be accompanied by a caveat that points out that an assessment of the CO_2 impact was not possible for all measures, particularly the measures in workpackages 8 and 12 where the measures tended to contribute to a wider change in mobility choices that was not possible to extract a quantified impact from within the many other influences on the public transport and wider transport systems within a vibrant city.

Also the size of the savings that were induced are dependent upon the size of the implementation and associated investment, which is where the cost effectiveness assessment has a role to play.

When looking at the cost effectiveness in terms of CO_2 emissions, then for the measures where this was possible the most promising measures are:

- Measure 5.2, biogas on the net in Malmö;
- Measure 5.3, biogas HGVs in Malmö;
- Measure 11.9, heavy eco-driving in Malmö;

all of which have shown a cost reduction for the implementing partner in association with the CO_2 reductions delivered by the measure.

These measures have shown a win-win scenario within the cost effectiveness assessment because the cost reduction can be identified by the organisation responsible for making the investment within the project. Two other measures, 11.3 (travel planning) and 11.4 (car pooling), both implemented in Norwich, have provided enough data to show that the overall cost for the full stakeholder group would be negative, so also delivering a win – win scenario. However, the cost savings that make this possible are the reduced fuel costs of the individuals who have participated and changed their behaviour, and which have not been captured directly in the cost effectiveness figures at the measure level.

Finally the policy measures 7.1 and 7.2, which involve the use of parking charge policies in Malmö and Norwich to influence public behaviour towards purchasing clean vehicles over a longer timescale, also appear to score well in cost effectiveness terms. This is in part due to the fact that the cost of implementing the change is largely borne by the individual rather than the implementing authority. However, because these measures are based on an investment on a rolling basis as the fleet is renewed and largely involve looking for incremental rather than step changes in purchasing patterns then the overall cost impact should be modest.

The four measures, as implemented in SMILE, that appear to have contributed most to reducing local pollutants emissions (NOx and PM_{10}) are:

- Measure 6.2, Low Emission Zone in Norwich, which delivered annual reductions of 10,000 kg NOx and 430 kg PM_{10};

- Measure 6.1, extension of the environmental zone in Malmö, which delivered annual reductions of 19,700 kg NOx and 370 kg PM_{10};
- Measure 5.6, renewal of the bus fleet to operate on LPG in Suceava, which delivered annual reductions of 6,163 kg NOx and 386 kg PM_{10};
- Measure 5.5, purchase of four CNG buses in Potenza, which is estimated to deliver annual reductions of 3,933 kg NOx and 63 kg PM_{10};

The focus of the measures in this list is very much one of technology linked with measures that are directly aimed at local air quality, particularly the low emission / environmental zones, so it does appear that these measures are delivering the benefits that they are intended to. In fact, to reinforce this, measures 5.6 and 5.5 are also directly or indirectly linked to the concepts of providing priority, low emission transport services in the city centres

When looking at the cost effectiveness in terms of local pollutant emissions, then for the measures where this was possible the most promising measures are:

- Measure 5.5, purchase of four CNG buses in Potenza;
- Measure 5.3, biogas HGVs in Malmö;

both of which have shown a cost reduction for the implementing partner in association with the observed NOx / PM_{10} reductions delivered by the measure. However, measure 5.5 is associated with a 12.5% increase in CO_2 emissions, and so should be viewed with caution unless this is considered acceptable due to acute local air quality problems or if an alternative way of reducing CO_2 emissions can be found, for example the use of biogas instead of CNG.

Measure 5.7 – the promotion of LPG to commercial and fleet operators – also scores well from a cost effectiveness perspective, and vehicle owners should also benefit from a lower fuel cost, which is again not captured within the project level cost effectiveness assessment.

Of the policy measures 6.1 and 6.2 appear promising from a local authority perspective, but care must be taken in this regard because the investment in the technology required to meet the emission standards that are set for the zones is likely to be required of vehicle operators rather than the local authority, (although they may also be an operator of municipal vehicles that would need to meet the scheme criteria).

Finally, when considering cost effectiveness results it is important to note the way in which investment costs are considered, because some organisations may be able to defer these costs to an annualised basis, as has been done in the project cost effectiveness analysis, whereas for others the size of a single investment may in itself be a barrier than cannot be overcome.

There are many linkages between the measures, as would be expected from a project within such a wide ranging programme as CIVITAS, with the interaction all focused at delivering a more sustainable urban transport system that meets the needs of urban residents, workers and visitors.

Antagonistic effects are as important (if not more) than synergies and they need to be identified, so that the results are comprehensive, robust and useful for future application. Antagonistic effect identification would, in fact, be useful during measure implementation (if possible), so as to anticipate such unintended negative effects and their consequences. Antagonistic effects could be flagged up during the measure planning process, using past experience and the literature, where such effects were identified.

An example is the discussion about “Integration of cycling with public transport”, where it was pointed out that in the rush hours (2 hours per day) the bicycles have lower priority at intersections with road traffic. During the rest of the day, cycles have priority over buses and cars.

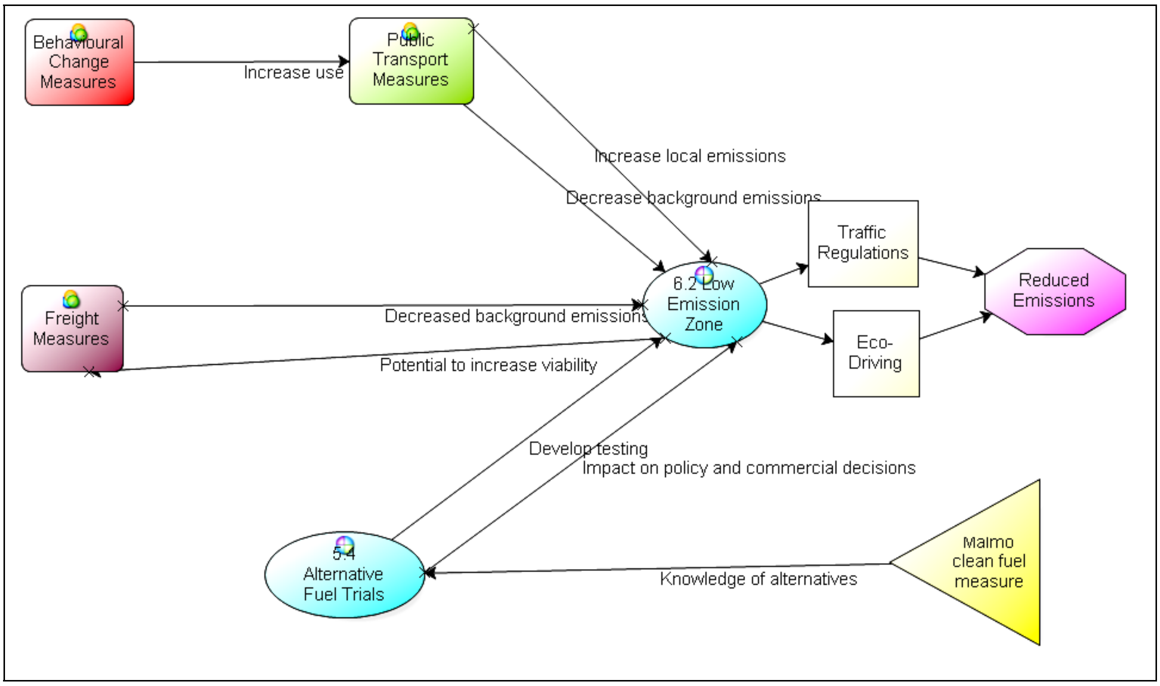
Another example concerns the extended environmental zone for heavy vehicles which might force the drivers of some “older” heavy vehicles (that are not allowed in the zone) to drive longer distances (i.e.

around the zone). If any of these drivers follow the eco-driving routine (e.g. from Measures 11.9 and 5.3), the longer driving distance will dissipate the positive eco-driving effects. However, this is unlikely since most of the heavy eco-driving measures are supplemented by clean fuel measures (that would allow the heavy vehicles in the environmental zone).

Synergies between measures were much more common, although not all the potential synergies identified within the project were actually realised. This is amply demonstrated by the interviewees in the cumulative effects analysis who observed that “in actual practice, while there are relations between the bus measures, the measure leaders have not always coordinated their efforts”. The issue of “Measure Isolation” surfaces here, for example in measure 12.4 which should have been included within the promotion of cycling in measure 11.1, but which appears to have been missed because of the reluctance of the measure leader to gain user feedback on an interim version of the cycle planning tool.

The links between the clean vehicle, low emission zone and incentivised parking for fuel efficient and clean vehicle measures are an obvious example. This is shown in figure 5.9.1, representing the situation in Norwich.

Figure 5.9.1: Measure 6.2 and Interaction with Other Measures with Effects on Emissions



There is a specific link between 5.4 clean fuel trials and LEZ measure 6.2 where buses using biodiesel undergo similar testing. Knowledge gained from clean fuel testing may influence local and national policies and provide information for commercial companies which could impact on the ability to meet emission standards in the longer term. Interestingly, the inclusion of measure 5.4 in SMILE led to sharing of knowledge and ideas with a biogas measures from Malmö which indicated that it would be fruitful explore gas as an alternative fuel source.

The public transport integration measures will have a positive effect on emissions throughout Norwich. However, it is noted that that increased patronage of buses could increase emissions within the LEZ. Whilst this potential antagonistic effect is real, it points to the need for monitoring emissions and taking action through measures such as the LEZ to counter localized problems arising from a successful public transport policy. Moreover, increased public transport use would be accompanied by reduced car traffic and congestion in the city and potentially lower background emission levels which would have a positive impact in reducing emissions. The various behaviour change measures which would encourage or facilitate the use of public transport would have a similar effect. They would only have an antagonistic effect where the public transport choice resulted in extra public transport in the vicinity of the LEZ. To the extent that these measures encouraged walking and cycling they would have a positive effect on emissions generally.

The freight measures would also reduce the number and increase the cleanliness of freight entering the city centre. Again, this would have a positive impact on background emissions in the LEZ. Potential future synergies were also identified between the use of clean freight and the LEZ (6.2). These would occur if the LEZ was expanded to cover freight as well as buses and if it extended in area. This would make the use of clean vehicles and possibly of the transhipment centre vehicles much more attractive. This, it was thought, could tip the balance in making clean vehicles more attractive.

In addition to this there are many other examples. This means that the grouping of the measures by workpackage, though broadly useful, should not be seen as a strict demarcation between measures. This is because although notionally within different workpackages individual measures have a certain impact but several are also generally mutually reinforcing or in some cases might act against each other (antagonistic). Measures may also have common approaches and outcomes across these groups. This section highlights some key interactions amongst measures.

During this report some of the most significant synergies have already been identified in relation to the key objectives. As mentioned above it is recognised that groups of measure or ‘clusters’ address different aspects of transport, with most of the synergies referring to group effects that operate as a package. A distinction then needs to be drawn here between synergies towards achieving an objective, an effect (e.g. energy reductions) or an outcome (from now on called “outcome synergies”) and “operational synergies” in which the operation of one measure actively assists the operation of other measures.

The grouping of measures and the overall sustainable transport goals for the SMILE project suggest that there are many “outcome synergies”, the most significant of which have already been identified. Some “weak” outcome synergies appear that might not very important from a policy perspective. For example, the eco-driving measures are shown as synergistic to each other in the evaluation reports, since they aim at almost identical outcomes, without the operation of one measure reinforcing the operation or the outcome of the others. It is true that having contact with others, who have already applied this measure, may provide practical information for organising such training. However, this is as far as it gets, since there is no added value or untapped benefits from cooperation with other organisations when applying these measures (unless better price for the driving courses can be bargained). These weak outcome synergies can also be found in the combination of eco-driving and clean fuel measures that converge to the common outcome of reduced CO_2 (and energy consumption).

An example of “operational synergy” is expansion of biogas production and distribution in the Measure 5.2, actively assisting all measures that include biogas fuelled vehicles (i.e. 5.1, 5.3, 5.8 and 9.1) towards the overall aim of energy and CO_2 reductions, an outcome reinforced by their combined implementation.

All the bus measures (i.e. 8.1, 8.2, 12.1, 12.3 and 12.7) in Malmö obviously share outcome synergies, since their overall goal is the improvement of bus services, with the subsequent environmental and transport outcomes. There are however, some operational synergies to be found within this group. The Automatic Vehicle Location system was installed and improved as part of measure 12.7, but provides also the infrastructure for the operation of measure 12.1. The real time information in measure 12.1 also feeds into to measure 12.3 that communicated it through mobile media, using the Automatic Vehicle Location infrastructure.

6 Conclusions and Recommendations

The purpose of this chapter is to draw together the main points that have emerged from the CIVITAS SMILE project in terms of the impacts attributed to the demonstration measures and processes undertaken to achieve these results.

The chapter is split into three sections. Section 6.1 focuses on the main conclusions of the evaluation, drawing on the material contained within the preceding chapters. Section 6.2 briefly reflects on the evaluation methods and processes that have been used to reach this point and offers some observations that may be helpful when considering evaluation in similar contexts in the future. Finally section 6.3 contains some policy recommendations regarding future development and application of measures in the context of sustainable transport policy and related initiatives.

6.1 Summary of Technical & Process Evaluation Conclusions

The analyses of the measures individually, within the city contexts and by workpackage, have confirmed both the impacts of the individual measures but also the variations and linkages across the wide range of measures that have been implemented in the partner cities.

- Significant, quantified impacts have been identified within the project duration for many of the measures particularly in workpackages 5 (clean vehicles), 6 (access restrictions), and 11 (Soft Measures).
- The measures in workpackage 7 have also been shown to have a quantifiable potential, but over a longer time period due to the nature of the measures in influencing the gradual replacement of the overall private vehicle fleet.
- The small scale of intervention, the diffuse / indirect nature of the impacts and the different characteristics of the three measures in workpackage 9 (new forms of vehicle ownership) have made it difficult to draw consistent conclusions about this type of measure, although they do show promise.
- The measures in workpackages 8 (public transport) and 12 (telematics) have generally been found to be supporting measures for which isolating a direct quantifiable impact within the broader context of a city's transport system is difficult. However, public surveys have shown these measures to be well received and to contribute to modal change, although in isolation or at a limited scale their impact would not on their own be enough to produce a noticeable effect at the city or possibly even route level.
- Finally the measures in workpackage 10 (freight) have proved to be the most disappointing, with only marginal impacts being observed for one or two measures.

When considering the impact of the measures in the workpackages that were relatively more successful:

- The clean vehicle and fuel measures have generally been successful in delivering emissions reductions both in terms of greenhouse gas reductions and local air pollutants, although there are variations between fuels, with a marginal increase in CO_2 emissions for the CNG buses in Potenza to be offset against the local air pollutant benefits.

- In combination with this the behavioural change measures have generally been successful in achieving substantial changes in behaviour, with the resulting greenhouse gas reductions being easier to identify (due to their direct link to fuel use) with direct changes in local pollutant emission and consequent air quality impacts being harder to identify.
- For the access control schemes that have delivered significant reductions in local air pollutants there is a strong element of supporting measures in order to help the access control schemes reach their goals. This comes as a mixture of higher level, long term policy formation and intervention (outside the formal SMILE project definition) and measures specifically defined and delivered within SMILE. Examples include:
  - The policy decision in Malmö to invest in gas powered buses within the urban bus fleet which has been implemented over a number of years to ensure complete fleet compliance.
  - The subsequent upgrade to vehicle gas in Malmö, done in conjunction with SMILE, so that 50% of the gas requirement for public transport is now from renewable sources.
  - Part-funding for retrofitting of vehicles that use the Norwich Low Emission Zone with particulate traps and / or selective catalytic reduction devices, so that they meet the NOx and particulate emission criteria laid down for access to the zone.
  - Eco-driving training to 90 bus drivers who regularly work on services passing through the Norwich LEZ.
  - Research into biodiesel and the impact of NOx levels within the Norwich LEZ.
  - Investment in the new public transport vehicles in Suceava and their subsequent conversion to LPG using SMILE co-funding.
  - Supporting investments in public transport priority measures in Suceava.

The effect on the sustainable transport system of access control measures, which are effectively detailed policy interventions that dictate a public and market response, is comparable to that of the other group of pure policy interventions – the pricing measures. Again to be successful these need to be aligned with what is achievable within the local market. The intervention in Malmö which focused on clean vehicles was appropriately targeted because of the greater maturity of and greater financial support for the clean vehicle market in Sweden, and is likely to have a greater effect that had the measure been replicated in Norwich. The intervention in Norwich, which targeted fuel savings by promoting smaller cars was again appropriately targeted because it was adapted to local conditions and a mechanism that was available to be changed.

Many of the measures work in a synergistic way, as has been identified throughout the report. The ways that this will ultimately be felt for the types of measures implemented in CIVITAS SMILE are:

(4) Reductions in car kilometres

(5) Changes in modal shift to more sustainable modes

(6) Lowering in atmospheric pollutant levels.

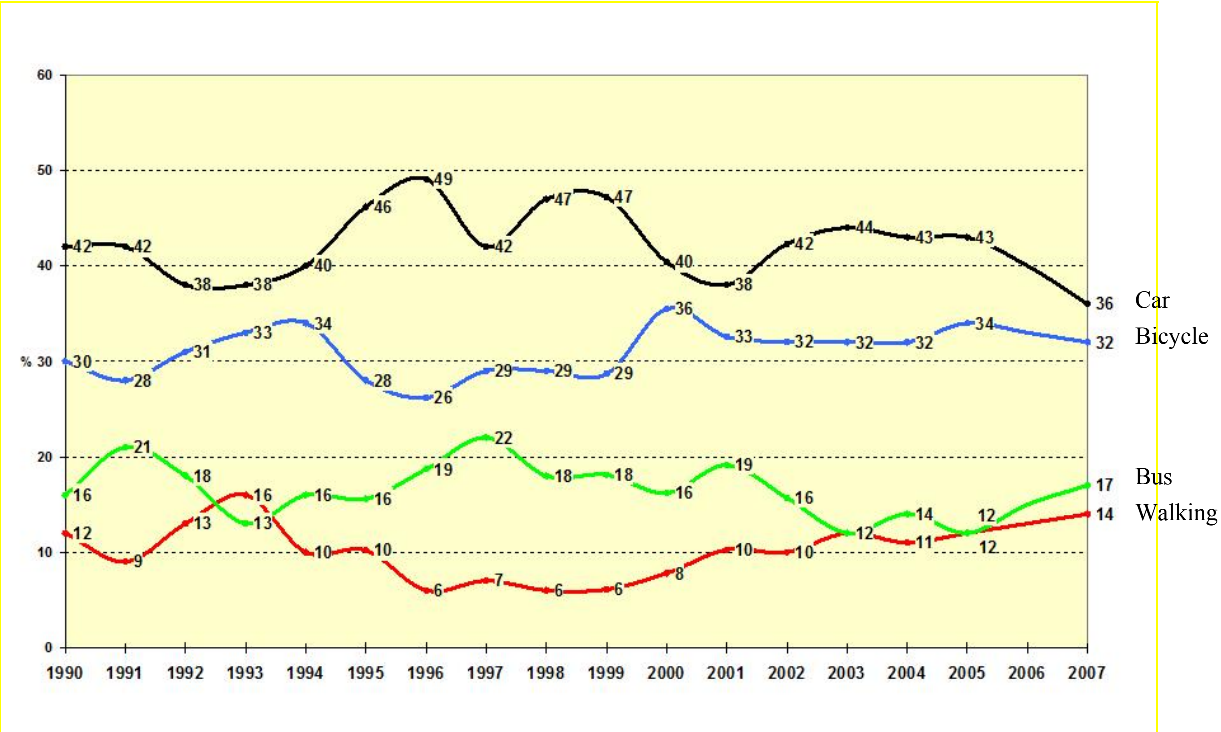
The problems with using these indicators directly are:

- within a city environment the scale of the intervention of a demonstration project is limited compared to the scale of the wider economy, which means that the effects, even of a relatively large project such as SMILE, can be swamped by other changes to the transport system
- these indicators are also directly related to changes in the wider economy; this influence has already been seen in Tallinn and Suceava where growing prosperity has led to increased car ownership and use, so driving modal share away from sustainable means. Similarly increasing

economic prosperity and population have both been directly linked to increases in the overall demand for transport (both by people and goods) and hence increases in emissions.

Therefore SMILE is to some extent working against the macro level business as usual trend (except in times of recession) and at a level where the evaluation at a project would be subject to too many external variables to be able to provide definitive results.

That said, Figure 6.1.1 provides evidence from Malmö that the combination of the SMILE measures, with other policies and external factors acting on transport in the city is having the desired effect by illustrating the ongoing development of modal share in Malmö. The sample size is too small for statistical conclusions to be drawn, but is promising to note that car use has gone down by 7% from 2005 to 2007, when it reached its lowest point of 36% for the last 18 years. There is also a comparable increase in bus use of 5% for the same period (2005 to 2007), as well as an increase in walking and relatively stable share for cycling. A similar trend is picked up by the larger 5 yearly surveys conducted in 2003 and 2008 which have more statistical weight.



(Source: Skånetrafiken, annual telephone survey of 500 people, for work/school trips during the winter season)

Figure 6.1.1: Modal Split in the wider area of Malmö (main transport mode per person)

Table 6.1.1: The Trend PT Passengers from 2004-07 in Malmö

Time period	Number of passengers	Increase
Jan-04 to Dec-04	25 133 891	--------
Jan-05 to Dec-05	25 407 269	1,09%
Jan-06 to Dec-06	27 319 571	7,53%
Jan-07 to Dec-07	29 163 239	6,75%

Source: Skånetrafiken

The fact that bus use has increased as shown in Figure 6.1.1 and confirmed in Table 6.1.1 suggests that the bus related SMILE measures (8.1, 12.1, 12.3 and 12.7), may have had a positive effect, although the biggest change to pubic transport in Malmö in recent years – the actual reorganisation of the bus routes rather than the marketing of the change – was not formally a SMILE project element.

Additionally, these data do not show the development of total travel in Malmö in the period to gauge the wider context, as total car kilometres travelled may actually also be rising.

As was identified in chapter 5, the measures with the most significant quantified benefits were as follows:

- Based on the evaluation of the measures as implemented in SMILE, the five measures that appear to have contributed most to reducing CO_2 emissions are:
  - Measure 11.3, travel planning in Norwich, which delivered annual reductions of 1134 tonnes CO_2;
  - Measure 5.2, biogas on the net in Malmö, which delivered annual reductions of 431 tonnes CO_2 within the project period, but has inherent capacity to increase this to 1121 tonnes CO_2 per annum;
  - Measure 11.9, heavy eco-driving in Malmö, which delivered annual reductions of 634 tonnes CO_2;
  - Measure 5.4, sustainable biodiesel supply chain in Norwich which will deliver annual reductions of around 600 tonnes CO_2 in the Anglian Bus fleet;
  - Measure 7.2, influencing the choice of vehicle towards smaller and more fuel efficient vehicles in Norwich, which is a long term policy measure with the potential to reduce annual CO_2 emissions by anywhere between 300 tonnes on a cautious scenario and 2742 tonnes on an optimistic scenario.
- The four measures, as implemented in SMILE, that appear to have contributed most to reducing local pollutants emissions (NOx and PM_{10}) are:
  - Measure 6.2, Low Emission Zone in Norwich, which delivered annual reductions of 10,000 kg NOx and 430 kg PM_{10};
  - Measure 6.1, extension of the environmental zone in Malmö, which delivered annual reductions of 19,700 kg NOx and 370 kg PM_{10};
  - Measure 5.6, renewal of the bus fleet to operate on LPG in Suceava, which delivered annual reductions of 6,163 kg NOx and 386 kg PM_{10};
  - Measure 5.5, purchase of four CNG buses in Potenza, which is estimated to deliver annual reductions of 3,933 kg NOx and 63 kg PM_{10};

When considering cost effectiveness, in terms of CO_2 emissions, for the measures where is was possible to quantify this, the most promising measures are:

- Measure 5.2, biogas on the net in Malmö;
- Measure 5.3, biogas HGVs in Malmö;
- Measure 11.9, heavy eco-driving in Malmö;

all of which have shown a cost reduction for the implementing partner in association with the CO_2 reductions delivered by the measure. These measures have shown a win-win scenario within the cost effectiveness assessment because the cost reduction can be identified by the organisation responsible for making the investment within the project.

Two other measures, 11.3 (travel planning) and 11.4 (car pooling), both implemented in Norwich, have provided enough data to show that the overall cost for the full stakeholder group would be negative, so also delivering a win – win scenario. However, the cost savings that make this possible are the reduced fuel costs of the individuals who have participated and changed their behaviour, and which have not been captured directly in the cost effectiveness figures at the measure level.

Finally the policy measures 7.1 and 7.2, which involve the use of parking charge policies in Malmö and Norwich to influence public behaviour towards purchasing clean vehicles over a longer timescale, also appear to score well in cost effectiveness terms. This is in part due to the fact that the cost of implementing the change is largely borne by the individual rather than the implementing authority. However, because these measures are based on an investment on a rolling basis as the fleet is renewed and largely involve looking for incremental rather than step changes in purchasing patterns then the overall cost impact should be modest.

When looking at the cost effectiveness, in terms of local pollutant emissions, for the measures where is was possible to quantify this, the most promising measures are:

- Measure 5.5, purchase of four CNG buses in Potenza;
- Measure 5.3, biogas HGVs in Malmö;

both of which have shown a cost reduction for the implementing partner in association with the observed NOx / PM10 reductions delivered by the measure. However, measure 5.5 is associated with a 12.5% increase in CO_2 emissions, and so should be viewed with caution unless this is considered acceptable due to acute local air quality problems or if an alternative way of reducing CO_2 emissions can be found, for example the use of biogas instead of CNG.

Measure 5.7 – the promotion of LPG to commercial and fleet operators – also scores well from a cost effectiveness perspective, and vehicle owners should also benefit from a lower fuel cost, which is again not captured within the project level cost effectiveness assessment.

Of the policy measures 6.1 and 6.2 appear promising from a local authority perspective, but care must be taken in this regard because the investment in the technology required to meet the emission standards that are set for the zones is likely to be required of vehicle operators rather than the local authority, (although they may also be an operator of municipal vehicles that would need to meet the scheme criteria).

Finally, when considering cost effectiveness results it is important to note the way in which investment costs are considered, because some organisations may be able to defer these costs to an annualised basis, as has been done in the project cost effectiveness analysis, whereas for others the size of a single investment may in itself be a barrier than cannot be overcome.

There are many examples of measures working together to meet common outcome objectives. Two prime examples are:

- the way that access restrictions link with other clean vehicle, clean fuel, car ownership and charging and travel information measures in the partner cities, as has been detailed earlier in this section;
- integration of public transport provision (route network), quality (e.g. safety and security), information (mobile internet and real time info), priority (infrastructure and telematics) and publicity.

The upscaling analyses have shown that there is significant potential for expansion of many, though not all, of the measures. This is in part due to the experimental nature of many of the measures where to fully implement would have been an excessive risk without a prior demonstration phase, but also because the finances needed for a full scale implementation are in many cases prohibitive unless the financial investment can be phased.

The importance of collaborative approaches has been clear throughout the project, from initial inception of the project and its measures through to delivery and evaluation. Partnerships have not always worked, as seen by the changes that became necessary in Potenza, with a change in public transport provider during the project. The approach required to working in partnership is perhaps one that is slightly different to the norm in the transport field, where a hierarchical, contractual arrangement is often more common.

A relationship that is perhaps more difficult is to get organisations that are not used to working together to agree on making progress towards sustainable transport goals. This is the case for example when implementing voluntary workplace travel plans. The tensions in this type of working can be seen in comments from private sector organisations about the balance of investment and benefits lies, but part of the route to success in this case is to identify the benefits and motivating factors for organisations to participate; this could lead to the development of a business case for participation, which will always carry more weight for a private sector organisation than corporate and social responsibility on its own. (This process mirrors the need to understand the motivational aspects of a travel behaviour campaign aimed at individuals, identifying the different things that will make a difference to that specific person.)

CIVITAS is primarily focused on urban transport. However, it is very difficult to consider the urban transport in isolation from the wider regional perspective. This is reflected both in the formation of the SMILE partnership, which includes a range of regional authorities and one regional transport authority, and also in the measures, many of which have a regional rather than purely urban perspective.

The value of communication and information measures is often overlooked in terms of how they can help to make best use of existing services and infrastructure. The experiences of implementing the measures in workpackage 11 clearly addresses this and shows, again, the benefit that can come from making sure that people base their travel decisions on the full facts. However, the temptation to rely solely on information and marketing also needs to be resisted. People will only buy any service or product if it works; and in the transport this relies on a sustainable transport option being present that meets several other basic criteria, including convenience, cost, reliability safety etc. As in so many aspects of this project and these conclusions we again reach a position where no one single solution is the panacea to sustainable transport – a full integrated, approach is needed – as if CIVITAS were expanded 100 times so that instead of being a demonstration programme it were the norm!

There are clear differences in the fiscal regimes that exist between the countries / cities, which have a clear influence on the way in which measures can be implemented and what can be pursued. For example:

- One of the most promising measures in Malmö has been the deployment of biomethane infrastructure for refuelling vehicles either directly or via use of the gas grid as a transfer means. However, this is dependent upon the level of financial support (reduced fuel duty) for this renewable fuel according to the national fiscal regime, and certainly in the UK this measure would not have been treated in a comparable manner had it been implemented in Norwich during the SMILE contract period. Similar issues would mean that in the UK biodiesel at blends higher than 5% blend are discouraged in the bus fleet due to the duty regime, even though the SMILE research has indicated that a 20% blend provides the best balance between local air quality pollutants, operational issues and greenhouse gas emissions.
- It appears to be accepted practice in Italy for demand responsive transport services to be granted local subsidy to ensure provision of inclusive public transport to the remote parts of the regions. This comes at a significant cost (the estimate in Potenza was annual operating costs of around €100,000), which would be seen as difficult to justify in other locations where there are different public expectations and demands on local authority budgets.

6.2 Reflections on the Evaluation Process

This evaluation report begins with a discussion of objectives, the different types of objectives and how they link through to define the indicators that are driving the project implementation and hence are relevant to the evaluation. This issue of objectives needs to be addressed at the core of any project specification, ideally at the proposal stage. Across the range of measures implemented in SMILE and the various sites the understanding of this issue was not always well understood. In some cases those responsible for measure implementation were very focused on just that implementation, rather than considering the wider purpose of why the measures were being implemented, i.e. to drive forward the provision and use of sustainable transport in the partner cities. This was not helped in those cases, often highlighted in this report, where the stated objectives also focused on project outputs rather than the outcomes and the process of achieving them. To help this it would be useful if a more formalised structure to the evaluation were to be used including initial scoping, ex-ante and then ex-post evaluation as recommended to the European Commission some years ago by the MAESTRO project.

In order to assess quickly if objectives are being met it is important that interim milestones are built into the evaluation so that data is collected, assessed for suitability and initial results and user feedback is obtained in order to identify problems before a measure is too far committed. Though specified, this process was not always followed, in part because it might have been perceived as introducing delays in what were often very tight planning and implementation timescales. This may read as an implied criticism of some of the measure leaders, but it is in fact meant as a more philosophical reflection on how evaluation can be helped by the way in which the project is focused in its early stages.

Linked to this is the issue of how the evaluation teams are organised. The set up differed in the SMILE sites, with effectively 3 different systems:

- In Malmö and Tallinn independent university staff led the evaluation, being reliant on those involved within the measure for information relating to the progress of implementation and also to much of the required data.
- In Suceava and Norwich those involved in the measure implementation were also primarily involved in the evaluation, which meant that they were closer to the measure, its progress and also the specific data requirements.
- In Potenza a third situation was present as an external consultant was initially contracted to conduct the evaluation, although they subsequently left the project team to be replaced by someone from within the municipal structure.

There are pros and cons to all three arrangements and it is not necessarily possible to say that one arrangement is better than another. However, what is clear is that for the evaluation to work, those involved need to be 100% clear on the data required, how it will be collected, when it will be collected and its purpose so that they can identify where problems might arise if it the collection process is compromised. In order for this to work strong communication channels and clear responsibilities need to be in place and for a project of this size this is not always easy. This is particularly the case when there are many changes in measure leaders and also individual measure specifications and timescales, particularly in the early stage of the project. In the early stages there was a desire to fully specify the evaluation at an early stage, and rightly so because of the need to plan for baseline data collection, but this also leads to the risk that if a measure specification changes then the baseline data is no longer relevant.

The timing of measures and their impacts is crucial to the evaluation. In many cases the measures need to be considered as having a long term impact, to balance the long term investment plans that are required for their implementation. Even when a measure sticks to its original implementation schedule there is a strong risk that evaluation at the end of the implementation period, in order to respect the contract terms of the demonstration project, will lead to an assessment that does not truly reflect the success or otherwise of a measure. Examples of this could include what initially proves to be a successful implementation, but after a limited period of operation suffers a catastrophic technical failure after the evaluation is conducted; or on the other hand evaluation of a measure when it has not had time to build a successful user base or where the appropriate recruitment technique is not found until after the evaluation.

Although the involvement of measure leaders or those close to the implementation of the individual measures is essential, it does pose a risk to the evaluation because it is possible for them to lose sight of the broader picture and become too focused on the individual measure. It is at this point that the role of the site level evaluation manager becomes important. This links to the need to assess the linkages between the measures and becomes especially important when considering the impact of measures that might be expected to have an impact at the city level. To help with this it is important to be able to access data that is collected at the city level, such as the annual modal split data for Malmö, in order to establish a macro level picture of how the measures are working collectively within the wider city environment to lead to the desired outcomes, even if it is not possible to isolate the exact contribution and the causal link to the project measures.

The level of information and expertise available within the cities has been raised from time to time internally within the project. Generally this does not appear to have been a problem and where it has there has been sufficient expertise present within the project team to answer most specific queries. However, one issue that has remained unanswered is the level of city-wide data collection and modelling expertise in Tallinn and particularly Suceava and this is an issue that is likely to be common for many small and medium sized cities in the new member states.

Financial issues have been highlighted as important in the measures that were chosen for demonstration, the way that they have developed, and the way in which transferability is likely to occur. To help with this a cost effectiveness assessment has been conducted as part of this project. The justification for taking this approach within the project is presented in section 2.2 and although not perfect it appears to provide a useful comparison of the measures from a retrospective project evaluation perspective. A desire has been expressed for projects to conduct full cost benefit analyses and we feel that there is a need for caution in following this approach because the data requirement would increase significantly and unless the resources for the evaluation are to be increased be a commensurate amount then this is likely to raise expectations to a level that will be difficult to fulfil.

The final reflective point that needs to be made is in respect of the use of online databases, which offer a very seductive solution for the collection of common data from different sites. However, for projects such as SMILE, where the main partners are public authorities, which for good reasons tend to have very complex and cautious centralised IT policies and structures, this method has been shown to be difficult to implement in a way that does not cause significant user frustration.

6.3 Policy Recommendations

The policy recommendations section has been structured to follow the headings agreed for contributions to the CIVITAS final conference held in Toulouse in January 2009. However, an additional heading ‘Technical Recommendations’ has been added to provide guidance based on the technical conclusions contained within section 6.1.

Throughout these recommendations it is important to remember that mobility is a derived activity; travel is something that people do in order to reach some other objective, even if it is merely going for a walk or a drive, then they do so in order to gain satisfaction and pleasure of to derive a health benefit from the activity. Because of this, issues around transport are affected by other aspects. For example, economic cycles and other policy decisions as well as personal preferences and personal financial considerations all combine to influence overall levels of transport demand, the degree to which this demand can be met, the distances that need to be travelled and the choices over mode used and whether a journey is actually made. This all means that transport policy cannot be viewed in isolation from other aspects of public policy, as has been noted earlier in this report and is reflected in the links with for example, land use policy development within the SMILE cities.

6.3.1 Provision of Political, Policy and Regulative Support

Political backing has been shown to be a key success factor in delivering the innovative sustainable transport measures within SMILE. Without such backing it can be difficult to mobilise the effort, co-operation or budget necessary to break from the norm. This is also important when attempting to get collaboration from different departments even within the lead organisation, as was found in Malmö when attempting to release staff to attend eco-driving training. Therefore:

- Clear, unambiguous direction from senior staff and politicians is needed about the priority to be given to clean, sustainable transport.

It is clear that certain institutional frameworks can help with this, for example in the situation where mayoral authority is the key to action within a municipality.

Similarly, national and international legislation that places a statutory duty to meet certain targets or follow certain procedures ensures that issues are prioritised.

Relevant examples of this include:

- the local air quality regulations that place responsibility for monitoring and action on the local authority
- the recent proposals that public institutions should consider full life-cycle costs and environmental impacts when purchasing or leasing vehicles or specifying transport services.

These actions are in direct coherence and synergy with the priorities and activities of SMILE.

Broader regulation and targets are also important, as they can influence the way a measure can be implemented. The influence of regulations, sometimes in seemingly unrelated areas, can have an impact. This ranges from European legislation, where the biofuels directive has been a driving force for low blend biofuels, but has not necessarily helped high blend trials or differentiated between fuels on sustainability grounds, to local planning conditions, where the terms and costs of licensing regulations were enough make a pedestrianisation scheme in Norwich less favourable for the local traders. National air quality targets that were applied in central Norwich potentially presented a barrier to the integration of biofuels and vehicle-based emissions reduction technology within the low emission zone. Thankfully the hard work of the University of East Anglia to conduct the necessary fundamental saw this combination of fuel and technologies come to fruition to provide maximum environmental benefit.

- Ideally innovative demonstration projects such as CIVITAS can help to drive and form new national standards, as has been the case with Malmo participating with the other main cities in defining a Swedish standard for low emission zones.

The presence of a well planned and documented transport and environmental strategy has been shown to be beneficial by providing a structure for the inclusion of innovative measures, providing that the structure is well integrated across a range of areas such as land use planning, environment and transport and flexible enough to allow variation and innovation.

It is clear that this was the case in both of SMILE's main cities (Malmo and Norwich) and this was undoubtedly one of the factors that initially facilitated the successful bids from these cities and then enabled them to implement the wide range of actions required of them within the project.

During the course of the projects other SMILE cities, notably Suceava and more recently Potenza have been attempting to learn and develop appropriate strategy frameworks to learn from these experiences.

- The development of such policy frameworks and associated, costed delivery strategies is included in some national legislations. It is recommended that where this is not the case then action is taken either at national level to develop such legislation or that cities and city regions take the initiative and develop such plans.

It is clear that the starting point of the sites is crucial in determining what measures and approach to implementation are appropriate.

The starting point of the various sites was very different in terms of both current focus of sustainable transport and the direction of future development. Because of this it is necessary to establish a clear current status assessment and a coherent set of objectives at political, strategic and functional levels within which the developments are made. For the SMILE cities this might have been something on the lines of:

- Malmo - very strong on public transport and cycling and looking to build on these strengths and generate wider integration
- Norwich - good public transport and a flagship park and ride system, again looking to build on these strength and generate wider integration
- Tallinn – comprehensive, but low quality public transport network which formed the focus of the measures with a general public transport upgrade and additional focus on key corridors
- Suceava – building on previous focus to build a sustainable city centre, with a focus on an overhaul of the public transport service provision and regulation and extension of the low emission zone
- Potenza – existing city centre traffic restrictions, but poor local public transport and high car dependency requiring a public transport upgrade and a strong mobility management intervention

For both Tallinn and Suceava, which as cities representing the new member states were formerly members of the eastern economic bloc, a balance had to be struck between the pace and extent of liberalisation that is allowed and the degree of regulation that is required in order to ensure a sustainable outcome.

In both cases it would appear that the rate of change has been immense, linked to rapid economic changes. This can result in potentially severe transport and environmental problems, which a programme such as CIVITAS may only be able to mitigate rather than prevent, such is the strength and speed of the change and the size of the investment required. However this situation also represents an opportunity and both Tallinn and Suceava have shown strong desire and capability to address the issues as they have arisen and to put in place measures that should stand the city in good stead for the long term, rather than looking for short term solutions.

In both cases, also, a strong political control and regulation of the transport market still exist (for Suceava this was reviewed and extended within SMILE) in order to provide the necessary level of planning and control.

In addition to the variability in policy / action statuses, the degree of backing in terms of traffic and land use modelling capability, transport and environmental monitoring and planning / parking control varies considerably and the lower level of expertise and systems in Tallinn and Suceava has been identified as a key area for improvement.

- These aspects (traffic and land use modelling capability, transport and environmental monitoring and planning / parking control) need to be a focus for development for many cities in the new member states if the support systems that will allow the development of appropriate transport policy frameworks and strategies as recommended previously are to be in place.

6.3.2 Availability of Financial Means and Economic Logic

Provision of finance for innovative measures has been a key reason for the cities to participate in CIVITAS SMILE.

The core funding available to local authorities tends to be for mainstream activities and those which have already got central government or local policy approval. Depending on the internal rules in place this may make identification of co-funding sources, whether internal or external, difficult. This, in turn, makes it difficult for cities to progress experimental or promising initiatives without some form of funding to allow an element of controlled risk or experimentation.

CIVITAS has been important to keep pushing the boundaries of innovative measures in the cities, either speeding up implementation of new ideas, or allowing innovative measures to be tested that otherwise would not be tested. The key step pushing on from such demonstrations is to ensure that successful measures have a business plan in place so that the benefits can be exploited and brought into the mainstream. This requires long term planning, for example using the approach taken in the Norwich freight consolidation centre, where the measure was set up through the design and tendering stage to ensure the ongoing liability is shared with a private sector operator.

In order for measures to reach the mainstream a justification needs to be established from the evaluation of the measures. In most cases this will involve a favourable cost effectiveness or cost benefit calculation. However, circumstances may exist where the political benefit from a measure may require continuation or expansion of a measure, irrespective of this. Whether this can be achieved depends on the degree of flexibility in the subsequent funding regime to be used (e.g. local / national sources).

The degree to which externalities and cost savings can be factored into the financial calculations on which these decisions are based is crucial to the overall case. Within the evaluation we have identified several cases where a direct financial benefit accrues to the project partners as a result of the measure. We have also identified cases where there is either a direct financial benefit but the systems do not allow it to be isolated / quantified or where the benefit is accrued by an individual or organisation that is not the implementation organisation.. This raises a number of issues related to the balance of investment vs benefit in sustainable transport measures. Three particular instances that have been noted in SMILE are:

- Where the investment is made by a public sector organisation and there is a direct or indirect financial benefit to those citizens that participate

This seems entirely appropriate and such benefits are a successful way of marketing sustainable travel initiatives to the public and rewarding them for making positive societal choices.

- Where the investment is made by a public sector organisation and there is a direct or indirect financial benefit to a different public sector organisation

This type of situation has been shown to lead to problems in some cases, missed opportunities in others, as well as some successes. For example, the collaborative working between City of Malmo and Skanetrafiken on many of the public transport and mobility measures has been achieved by identifying the mutual benefit of investing in infrastructure, service improvement and marketing, with ticket revenue being the obvious financial outcome, which should permit further service improvements – leading to a virtuous circle.

A similar pattern has been seen in Suceava, where the introduction of a new regulatory regime for private minibuses has both generated a market opportunity for the public transport company, but also generated an additional income stream for the municipality which it has then been able to invest into new buses.

However, the situation is not always replicable – in Norwich it proved impossible to persuade the main hospital to provide sustainable travel advice for people attending outpatients appointments, even though the health sector would be a long term beneficiary of the improved health outcomes from a change to more active travel and has to a certain degree contributed to access problems by virtue of building a consolidated hospital cite at the edge of the city, which is less well linked to sustainable transport provision.

- Where the investment is made by a private sector organisation (either voluntarily or as a result of local legislation) and there is an environmental benefit for the wider population.

This has been raised by several organisations asking why as a private sector organisation they should pay the full investment cost when the benefits are felt primarily by society at large as represented by the local public authority. Where co-financing through programmes such as CIVITAS are in place then this complaint can be mitigated, though not necessarily removed, depending on the levels of grant / co-financing that are available.

- This highlights the need to find ways to work across sectors, both in terms of the public and private sectors and also within the public policy framework so that the full implications of decisions can be understood. For example, if the full transport and environmental impacts of a hospital or school relocation were included in the bottom line calculation would the outcome be the same?

We have noted that there are clear differences in the fiscal regimes that exist between the countries / cities, which have a clear influence on the way in which measures can be implemented and what can be pursued.

- For the results to be truly transferable between cities / countries such fiscal differences need to be minimised because there is not only a direct effect, but a much more fundamental effect in terms of technology development and availability which takes time to overcome, even when changes are made.

6.3.3 Creation of Institutional Cooperation and Stakeholder Involvement

Institutional co-operation has been a common and often necessary theme throughout the SMILE measures. In the vast majority of cases it would be impossible for a single organisation to implement a CIVITAS measure because of cost or knowledge requirements linked to its innovative nature. In some cases the number of collaborating organisations has approached double figures! The basis upon which this co-operation happens is crucial and having the appropriate structures in place appears to help the necessary collaborations to be set up and exploited. This is particularly the case where there is a specific public/sustainable transport agency and then a number of contracted operators in place whose responsibility it is to provide the specified services.

There are many examples from SMILE that could be quoted:

Suceava – municipality and local transport company who collaborated to provide new vehicles and routes; municipality and schools and businesses for both sustainable mobility promotion and new mobility management actions.

Malmo – city authority and regional transport authority for many public transport and mobility measures; city authority and private sector businesses for eco-driving, car sharing, biogas and measures aimed at goods transport in and around the city.

Norwich – collaboration between city and county councils as joint partners with interlinked statutory responsibilities; direct liaison between city/county council and bus operators; liaison with private sector freight transport operators; liaison with schools, University of East Anglia and other businesses for mobility management / travel planning.

Potenza - collaboration between city and regional authorities in relation to initial mobility management / travel planning; liaison with businesses and other main institutions about subsequent mobility management / travel planning.

Tallinn – where again there were three service operators (both publicly and privately owned) providing the public transport on behalf of the municipality under contract.

The previous points about institutional structures and the way in which grant support programmes function in individual countries are clearly important to understand the issues that need to be addressed to make such partnerships work. Also important are clear understandings of the objectives of both the individual organisations and the project to be undertaken in order to avoid uncertainty and conflict part way through project delivery.

Although organisations involved in delivering the measures are working together to meet a common set of objectives, there will often be a contractual arrangement between commissioning organisation (often in the public sector) and a supplier – usually in the private sector.

- The scope of the contract for large scale, technical tenders is often wide ranging and complex. In such situations there needs to be thorough scoping of the technical requirements. Contracting organisations should ensure they are properly prepared for the procedures that this will entail, and allow for this in their implementation timetables. They will also need to have an appropriate level of in-house knowledge (or seek to obtain such knowledge), to ensure the right technical specification in tenders and to judge potential subcontractors' expertise.

When developing partnerships between public and private sector organisations the issue of intellectual property right can be a particular issue that needs to be carefully addressed. Within SMILE one of the telematics measures in Norwich was severely hampered because of the terms of an agreement that had been set up prior to SMILE. This pre-existing agreement prevented access to what would have been expected to be public information for uses other than those initially conceived without the payment of further significant access charges. This necessitated extensive negotiations, delays and in the end use of an alternative approach to the task and is a lesson for those specifying such agreements in future not to overlook the future potential of IT systems.

- On a related note, IT system compatibility is a particular issue which also often causes problems and has been an issue from time to time in Malmö and Norwich as efforts have been made to use information form several sources and make it available in a consistent, user friendly way through a single portal. Where national and international standards can help with this type of issue, even if they are advisory rather than statutory they should be followed in order to avoid such compatibility issues.

One of the most important legacies of the SMILE project will be the different institutional culture in the cities, particularly Malmö and Norwich, where there has been a transformation in the way in which the softer elements of sustainable transport such as information measures and travel planning are viewed. This helps not only bring different teams within the same organisation together, but also leads to the cross-fertilisation of ideas.

6.3.4 Increase of User Participation and Awareness

The role of user participation and awareness is recognised both by the importance given to dissemination of the project at the local level, and also by the existence of workpackage 11 which includes a number of communication based measures designed to raise awareness of and change behaviour towards sustainable travel.

The approach to local dissemination has varied between sites with some using a range of local media such as radio, television and newspapers, whereas other sites (particularly Potenza and Suceava) have approached it more as a detailed consultation exercise. Both approaches appear valid, as they were chosen to match the available facilities and user needs.

Without user awareness and participation the innovative measures are effectively pointless. It has long been recognised that even major infrastructure projects can be enhanced in terms of effectiveness through an associated introductory information campaign. The importance of such communications increases by a disproportionately large amount for many of the measures within CIVITAS which are effectively support measures to enhance existing infrastructure in one form or another.

The role of measures such as travel planning has been shown to have induced a major change in institutional perceptions in both Malmö and Norwich. This is not least due to the huge success of these measures, particularly in Norwich. This is shown by the contrast between the situation before SMILE when it was “incredibly difficult” to get transport engineers to engage with soft measures such as travel planning, to the end of SMILE when other staff involved in working groups and also coming to travel planning professionals for advice and colleagues in Development Control have been heard talking in the office about cycling routes as if they are serious about getting people out of cars. This will undoubtedly feed through to other policy measures and leave as a project legacy a different approach to these issues.

The potential for well-designed and targeted communication actions is easily demonstrated by two examples:

The first is from Malmö, where the Skånetrafiken campaign “Skånetrafiken for you” established a work-based targeted initiative had a very strong immediate impact and also a substantial lasting impact on travel behaviour for participating employees at a number of organisations. The key to this was to establish clearly the needs to the potential public transport users, make a clear offer of incentives to switch to use of public transport and in parallel with this develop a long lasting relationship between Skånetrafiken and their new customers.

The second example is from Norwich, where the County Council’s sustainable transport team established a new collaboration with, amongst other organisations, a group of independent schools in the city centre. The independent schools tend to have a much larger travel to school distance than normal, with many children travelling in from outlying villages. This opened the opportunity to exploit the existing Park and Ride network, and with the introduction of a new ticket structure, a significant modal shift was achieve for the final leg of the journey to school i.e. within the urban area.

- These measures emphasise the need to properly research user needs – a stage that is often omitted due to budget restrictions or eagerness to follow a proposed idea – before attempting to run an awareness / behavioural change campaign, so that it can identify the individual motivating factors and so maximise success.

This approach is taken to its logical extension in the application of personalised travel planning, which has also been applied in Norwich in the area around the University of East Anglia.

6.3.5 Technical Recommendations

The disappointing results from the freight measures highlight a particular issue that needs to be considered. CIVITAS and other projects often try to isolate measures within the city context, and there is often talk of urban freight initiatives and city freight schemes. However, this ignores the fact that the current economic system means that freight transport needs to be considered at a level that is broader than the individual urban level. Decisions that govern the movement of freight in our cities are often taken in locations far from that city, possibly in other countries. Similarly the vehicles that conduct the transport are often based at depots far from the urban area where land and labour is cheaper. This existing framework cannot be ignored even for urban freight consolidation schemes, which would introduce a break in the chain at the urban boundary, because that break in the chain cannot be a discontinuity that affects the economic effectiveness of the distribution operation.

The evaluation of individual measures has shown that there is scope with existing clean vehicle and fuel technologies to reduce emissions of both locally harmful pollutants, but also life-cycle CO_2 emissions if biofuels from sustainable sources are used, particularly those like biogas that are produced from waste. However, the indication is also that the combination of soft measures to modify travel choices and overall travel demand together with strong policy steers at all levels (such as low emission zones, further tightening of vehicle CO_2 standards, fiscal incentives to more fuel efficient and less polluting vehicles etc) will be needed as a package in order to meet our future environmental goals. In some parts there is a temptation to rely solely on a technical fix over the next 40 years, based on the assumption that the energy supply can be decarbonised. Whilst this might be the case, there is an inherent risk in relying on technologies that are not yet close to being developed. In the meantime there is an opportunity to start making the necessary changes to personal mobility behaviour, attitudes and expectations that will in all probability be needed anyway as part of any package for a sustainable future.

Transferability of measures is not guaranteed in exactly the same format because of variations in cultural, social and economic situations and contexts. For this reason it is important that adequate time, effort and resources are allowed for full research, motivational assessment and testing for many of the measures that are constituent parts of the SMILE project. Such steps should be inherent for many of the measures, particularly those that rely upon a change of behaviour by either an individual or an institution / company.

From a technical perspective two measures appear not to have worked as planned – measure 12.2 which involved the installation of a traffic monitoring and signal optimisation system and measure 10.1 – the freight driver support system – which was scaled back from a demonstration to a technical development project because of problems with the dynamic planning and scheduling element of the system. Both these measures appear to have potential to deliver positive benefits in their areas of application and so would be worthy of further, well monitored technical development. (Although measure 12.2 might be expected to be mature technology by now unless a particularly innovative algorithm is at the route of the problem.)

Two other measures that have not performed as well as might have been expected are measure 11.5 (individual travel planning) which did not produce the level of behavioural change observed in other similar projects and 10.5 the freight consolidation centre, which needed increased profile and regulation of the local access for freight vehicles to drive uptake.