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PROGRAMMES

MIRACLES Project GRD1 – 2001 – 40047

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MIRACLES
MULTI INITIATIVE
FOR RATIONALISED
ACCESSIBILITY
AND CLEAN LIVEABLE
ENVIRONMENTS

Deliverable D 4.2

REPORT ON EVALUATION RESULTS

Annex 4 – 2nd Implementation Report for Cork

Version N°4.0
31st March 2006

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Annex 4 – 2nd Implementation Report for Cork

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1. Introduction

This document is Annex 4 to D4.2 and also forms the MIRACLES deliverable "2nd Implementation Report for Cork". The Annex is a compilation of the detailed Measure-Level templates (MLTs) and City-Level templates produced for Cork as part of the evaluation process within MIRACLES. See the main body of the D4.2 deliverable for a summary and interpretation of the template results within this annex.

For the Cork site, there were 6 individual Measures in all, each reported within a separate MLT. Within this document, each chapter corresponds to a MLT. In addition, the final chapter details the city-level results, which have been sub-divided into five key areas: economy, energy, environment, society and transport.

2. Measure 5.1

MEASURE-LEVEL RESULTS	
Measure title: WP5 – Access Restrictions	**Project: MIRACLES**
Measure number: 5.1 Set up of City Centre Clean Zone	**City: Cork**

The Measure – what is it about?

M1: Measure objectives:

The objectives of Measure 5.1 were to:

- Provide a safer, healthier, more comfortable environment for pedestrians and cyclists in the city centre.
- Reduce lane capacity by 50% on the city's main arterial route, which cuts through the heart of the city's primary shopping district
- Redirect motor traffic away from the city centre and onto the ring roads or into the park and ride centres.
- Increase the numbers of cycle parking facilities within the city centre by at least 40%
- Increase citizen awareness of the need, potential and ability to change to more sustainable transport patterns.
- Promote access to the city centre by public transport, particularly, as a viable alternative to making all such trips by car.
- Reduce traffic levels through the access-restricted zone by at least 2%, as compared with the Do-Nothing scenario.

M2: Measure description:

The main city centre thoroughfare, St. Patrick's Street, was re-designed to reduce the existing four lanes to two. The pavements on either side were considerably widened providing new bicycle-parking facilities and textured paving for the visually-impaired to guide them along the street towards the crossings. New audible pedestrian crossings, over twice the standard width, were created to accommodate more pedestrian traffic. All on-street parking apart from taxi ranks was removed from St. Patrick's Street and access to nearby multi-storey car parks was redirected via alternative routes. Retractable bollards were placed on side streets off St. Patrick's Street at their entry/exit points. All of these changes were intended to make the entire city area more pedestrian/cyclist friendly.

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Mid-way through the MIRACLES project it was decided to extend the "Clean Zone". This included part of Grand Parade at the western end of St Patrick's Street and the pedestrianisation of Oliver Plunkett Street, which runs parallel to St. Patrick's Street. The retractable bollards were to be installed on the inbound side streets off Oliver Plunkett Street to restrict access into the entire expanded Clean Zone.

The Implementation – how was the measure implemented?

M3: Innovative aspects:

The redesigning of St. Patrick's Street was an innovative response to the challenge of providing more ample accommodation for pedestrians in limited city centre space. The ribbon-like design of the widened pavements made the most of the streetspace available between the buildings on either side.

The stylised design of the bicycle parking facilities was also very different from the normal cycle parking facilities provided in the past and is an excellent example of how an aesthetically pleasing street architecture design can be integrated with the promotion of sustainable transport.

M4: Situation before CIVITAS:

In the early 1990s, it was becoming increasingly apparent that the footpaths on Cork City's primary shopping street, St. Patrick's Street, were in need of extensive repair and widening. They were no longer capable of comfortably and safely accommodating the high volumes of pedestrian traffic in the city centre. Some preliminary designs were carried out at this stage but matters came to a head when the Cork Main Drainage Project in 1998, required that the street be dug up to lay the drainage network. Cork City Council decided to incorporate measures into the redesign of St. Patrick's Street that would further encourage more sustainable transport through the city.

In calculating the optimum dimensions of vehicle routes through the street the architects adopted the most recent thinking on traffic in the city consistent with the Traffic Assessment Framework (part of the Historic Centre Action Plan). According to this traffic lane dimensions should be determined on the basis of the number of vehicles it is desired should pass through the historic centre and not in terms of the greatest possible number of vehicles, which can pass through it.

M5: Design of the measure:

Pre-MIRACLES, Beth Galí Studios won a competition to redesign St. Patrick's Street. This design promised to minimise street clutter with a modern design, discreet enough not to detract from the existing urban architecture. When Cork City Council decided to apply for participation in the CIVITAS Initiative, it was decided to incorporate measures into the redesign of St. Patrick's Street that would further encourage more sustainable transport through the city. The aspects of the redesign supported by MIRACLES/CIVITAS funding were:

- The reduction in the number of traffic lanes available for motorised transport in St. Patrick's Street from 4 to 2 along the full length of the street,
- The widening of footpath pavements in a manner attractive to a wide range of user groups. There was extensive consultation with special interest groups representing the blind, wheel chair users, street traders and taxis etc to ensure that the streetscape would cater for their varying needs. The pavements would be generally very smooth to make walking safer for those with physical challenges that affect their mobility however they would also incorporate ribs of specially textured tactile paving along the full length of the street. This should help to guide the visually impaired as they walk up and down the street, as well as directing them to signalised crossings.
- The strategic installation of pedestrian crossings, which could be easily used by the blind, pushchairs, etc. These crossings were to be clearly marked. The crossings would be twice the width of a standard crossing (i.e. 6m) to accommodate extra volumes of pedestrians and pushchairs/wheelchairs.
- The installation of special cycle racks to co-ordinate with the other elements of street furniture. These would help to define the street space and enhance the aesthetics.

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- The installation of access control bollards on some side streets off of St. Patrick's Street to further restrict motor vehicles access to the city centre pedestrian priority zone. This was not part of the original street design but it was one of the features to be incorporated in keeping with the CIVITAS clean zone concept. The proposed access restriction bollards were to feature audible and visual warning devices, vehicle detection safety circuits and monitoring and control, which would be fully compatible with the City Council's existing technology.

M6: Actual implementation:

After the design by Beth Galí Studios, E.G Pettit was appointed to commence work on the engineering design. However further refinements to the design continued, which included modifications to incorporate CIVITAS funded features - such as the provision of access restriction bollards.

The design of alternative routing to accommodate the future access restrictions around St. Patrick's Street commenced in July 2001. In particular, a two-way system along the quays was introduced in October 2001 to facilitate the creation of the city centre clean zone. The new pavements were being laid in June 2002 and approximately 50% of the surface level works were completed by October 2003.This included the installation of an electrical ducting network for access restriction bollards, which proceeded along with the other works. The locations for these bollards were reviewed in May 2003 to take into consideration traffic circulation patterns and delivery requirements, they will operate from 11am to 5pm. All of the St. Patrick's Street renewal surface works were completed in September 2004 and the new–look pedestrian friendlier streetscape was officially opened by a special ceremony on European Car Free Day, 2004.

'Before' and 'After' Pictures of the St. Patrick's Street Redesign.

Buoyed by the success of this scheme, Cork City Council decided to extend the pedestrian priority zone into the upper portion of the Grand Parade (as far as Oliver Plunkett Street). (The Grand Parade extends southwards from St. Patrick's Street at its Western End :Daunts Square). The Grand Parade / Daunts Square redesign work was initiated at the end of July and will be completed by Summer 2005. It was also decided to extend the clean zone to the south to encompass the pedestrianisation of Oliver Plunkett Street (which runs parallel to St. Patrick's Street). This commenced on March 22nd, 2004.

Oliver Plunkett Street will only be accessible to pedestrians during the day according to the agreed schedule for operation of the pedestrianised zone. Goods delivery vehicles, etc. will be required to make their deliveries outside of these hours. Consequently, the precise hours of operation are subject to review; particularly with reference to the findings of the Cork Urban Freight Management Study which was carried out from September 2004 to March 2005.

Changes to the original WP 5 design were necessary to accommodate this extension of the Clean Zone. For example, the access restriction bollards will now be used to block entry to both St. Patrick's Street and Oliver Plunkett Street from the inbound lanes leading off the South Mall. (The South Mall is

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the road running parallel to both St. Patrick's Street and Oliver Plunkett Street.) Cork City Council is currently undertaking an urban freight study.

M7: Deviations from the plan:

The installation of the first access restriction bollards on Maylor Street was delayed by difficulties regarding the optimal effective positioning of the bollards, problems with suppliers and installers, etc. The layout of underground services in this area is particularly complex and posed unforeseen problems for the bollards installation. However, following the decision to extend the Clean Zone and pedestrianise Oliver Plunkett Street, the focus shifted to installing bollards to block entry to both streets. Access restriction bollards will now be used to block entry to both St. Patrick's Street and Oliver Plunkett Street from the inbound lanes leading off the South Mall. Installation commenced in early 2005, pilot operation commenced in November 2005. Some objections have been received and discussions with all parties are ongoing.

The Clean Zone was also extended to include the upper section of the Grand Parade which joins these two streets at the western end. The extension to the Grand Parade was originally part of the St. Patrick's Street concept and was delayed due to insufficient funds as well as gauging the reaction to the St. Patrick's Street redesign before expanding it further. As the St Patrick's Street works reached completion feedback was so positive from all quarters that once the funds were sourced it was decided to implement a much more extensive Clean Zone.

The Evaluation – how was it done and what are the results?

M8: Method of measurement:

Various tools were used to evaluate the 22 indicators for this measure. Survey work took place between May and November 2002 to establish the Baseline Scenario, which included noise level surveys, journey time surveys, cycle parking surveys, level of special services, on-street parking surveys and pedestrian counts. Further information was gathered from data sources such as annual air pollution reports, accident records, annual modal split and classified traffic volume measurements. The examination of records and drawings provided by Cork City Council provided information on financial matters, pavement widths and queue lengths. Interviews and focus groups provided information on the acceptance views of various user groups and operators. The frequency of measurement and exact sources of data is detailed both in the Cork Local Annex (Deliverable 4.1) and in the Cork Baseline Scenario Report, which is available on request.

Survey work was repeated in 2004 and 2005 to monitor the Ex-Post situation. Cycle parking, level of special services, on-street parking surveys, pedestrian counts, noise levels, user acceptance and operator acceptance surveys were carried out. Further information was gathered from data sources such as annual air pollution reports, accident records, annual modal split and classified traffic volume measurements. Records and drawings provided by Cork City Council provided information on financial matters, pavement widths and queue lengths. Information from the National Roads Authority supplied detailed accident records for a number of years. Interviews and focus groups provided information on the acceptance views of various user groups and operators. The frequency of measurement and exact sources of data is detailed in the Cork Local Annex (Deliverable 4.1). Further details can be found in the Cork Ex-Ante Report and details of the individual Measures surveys can be found in the additional Measure level reports which are available on request.

The retractable bollards were piloted in September 2005 during European Mobility Week, the regular restriction of Oliver Plunkett St. from 11:00 to 17:00 came into operation in late November 2005. Consequentially, it was not possible to obtain the reactions of those affected as yet.

M9: Achievement of quantifiable targets:

The number of lanes on St. Patrick's Street was reduced from 4 to 2 (achieving the 50% reduction in lane capacity), thereby encouraging a decrease in car traffic levels through the City Centre. The reduction in the overall level of car traffic through the inner cordon was 3.3% on the Do-Nothing

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Scenario which exceeded the objective of a 2% reduction, this was identified from traffic volume counts carried out in December 2005.

Increased urban accessibility and an improvement of citizens' quality of life should be partially achieved through the provision of extra cycle racks, seats and benches along St. Patrick's Street. The footpath widths were widened substantially, thereby increasing the number of pedestrians in the City Centre. (In May 2005, the evening peak displayed a 53% increase on December 2002). The widening of footpaths was greeted very positively; over 80% of user survey respondents rating them as "much better" or "slightly better". The overall opinion of the redesign and the opinion of visual improvement were resoundingly positive with over 60% rating it as "much better". The reduction in lanes and provision of cycling parking facilities (encouraged the increase in cyclist numbers (the 226 spaces provided far exceeded the 40% increase planned).

M10: Achievement of evaluation-related milestones:

- The 2002 Baseline evaluation took place between February and December 2002. This established a 'before' scenario for the Measure with the exception of the Visual Improvement and User Acceptance Indicators which were examined retrospectively by a 'before' and 'after' comparison in 2005.
- Monitoring of the impacts throughout the implementation of the Measure took place with the carrying out of a user acceptance questionnaire in December 2003, following the completion of the first phase of the re-design. Annual reports on air pollution, accident rates and traffic volumes were also compiled throughout the course of the project.
- Following the completion of the St. Patrick's Street redesign in November 2004, performance indicators were established for environmental, acceptance and transport indicators. This was slightly delayed from the originally planned milestone in mid-2004 due to the delayed opening of this phase.
- Finally, the ex-post surveys due to be carried out in July 2005 were delayed due to the expansion of the Clean Zone to include two adjacent streets. User acceptance surveys were carried out in May 2005, and the remaining ex-post surveys were carried out in Autumn/Winter 2005 and Spring 2006.
- Detailed Gantt charts showing the frequency of measurement of each indicator can be found in the Cork Local Annex (Deliverable 4.1).

M11: Report on the measure results:

This section describes the evaluation of MIRACLES Measure 5.1 'City Centre Clean Zone', the before and after photos of the city's main street (St. Patrick's Street) can be seen above. Initially just St. Patrick's Street was to be re-designed, however in 2004 the Clean Zone was extended to include Oliver Plunkett Street and the upper section of the Grand Parade.

The indicators for the evaluation of Measure 5.1 are broken into 5 sections; Economy, Environment, Safety, Acceptance and Transport. Many of these indicators are evaluated using both quantitative and qualitative data collection methods. A full explanation of the indicators and how they were quantified for 2002 Baseline Scenario is available in the Cork Baseline Report. Similarly for the Ex-Ante evaluation, a full explanation of the indicators and how they were quantified for the Do-Nothing and MIRACLES (Do-Something) 2006 is available in the Cork Ex-Ante Report, which is available on request.

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Name	Year	CO	Benzene	1,3-butadiene	NO_x	NO_2	PM_{10}	
		Annual mean mg/m^3	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Days $>50\mu g/m^3$
Baseline	2002	1.23	1.26	1.23	47.47	13.33	7.65	0.00
Do Nothing	2006	0.84	0.95	0.81	40.64	11.87	5.96	0.00
MIRACLES	2006	0.76	0.86	0.72	32.88	10.19	4.69	0.00
Ex-Post	2006	0.76	0.87	0.68	18.56	6.71	3.37	0.00
% difference		0%	+1.1%	-5.6%	-43.6%	-34.2%	-28.1%	0%

Table 1 Patrick's Street – Estimated pollutant concentrations using DMRB Screening Method.

Name	Year	Emissions				
		CO (kg/year)	THC (kg/year)	NO_x (kg/year)	PM_{10} (kg/year)	CO_2 (tonnes/year)
Baseline	2002	13,859	1,979	5,098	219	1,045
Do Nothing	2006	17,394	2,464	6,136	271	1,277
MIRACLES	2006	9,424	1,428	4,376	178	797
Ex-Post	2006	9,953	1,303	2,494	118	642
% difference		+5.6%	-8.8%	-43.0%	-33.7%	-19.4%

Table 2 Patrick's Street - Estimated annual emissions using DMRB Screening Method.

WP 5.1 City Centre Clean Zone Evaluation					
Indicator (Units) {*Meteor Core Ind}		Baseline 2002	Do Nothing 2006	MIRACLES 2006	Ex-Post 2006
C5.1/ Env1a	Emissions [CO2,CO,PM10,NOX] (ug/m^3) {5-11}	See Tables 1& 2	See Tables 1& 2	See Tables 1 & 2	See Tables 1 & 2
C5.1/ Env2a	Noise Levels (L Aeq dB) {12}	Average 69 LAeq dBA	Average 70 Ldn dBA	Average 68 Ldn dBA	Average 71 LAeq dBA
C5.1/ Env3a	Cityscape visual improvement (Index) {13 – 14}	N/A	N/A	Very Good	>60% Much Better
C5.1/ Saf1a	Accidents (No of acc/year) {20}	Total Casualties ~ 7. No of Vehicles~ 8	Similar to Baseline	Slight reduction to Baseline	2004 (2003) Total Casualties ~ 8 (4) No of Vehicles~ 5 (4)
C5.1/ Accp1a	Operator acceptance rating (Index) {13 – 14}	Very Negative	Very Negative	Very Positive	Very Positive
C5.1/ Accp2a	User acceptance rating (Index) {13 – 14}	Very Negative	Very Negative	Very Positive	>60% Much Better
C5.1/ Tran1a	Journey times (Minutes) {23 – 24}	Mean Peak Speed 14 km/h, Mean Off Peak20-25 km/h.	Increasing JT with speeds decreasing.	Increasing JT with speeds decreasing.	Mean Peak Speed 9.6 km/h, Mean Off Peak20-25 km/h.
C5.1/ Tran2b	Queue lengths (Metres)	Maximum average 111 metres	Increase to Baseline	Increase to Baseline	Increase to Baseline
C5.1/ Tran2c	Stationary time (%)	Peak average 44%	Increase to Baseline	Increase to Baseline	Peak average 67%
C5.1/ Tran3a	Classified traffic volumes (Peak and AADT Volumes)	AADT 15900, Peak Hour 1250	AADT 18200	AADT 11800	Decreased by a third on the Baseline

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C5.1/ Tran4a	Number of lanes (Number)	4 lanes	4 lanes	2 lanes	2 lanes
C5.1/ Tran4b	Parking spaces (Number)	12 (2 disabled), 25 motor bicycle, 35 taxi, 10 delivery	Similar to Baseline	No parking spaces provided. Taxi ranks and delivery areas provided.	No parking spaces provided. Taxi ranks and delivery areas provided.
C5.1/ Tran5a	Average modal split (% by mode) {26 -27}	81% Car, 5%Bus, 2%Motorcycle, 7%LGV, 4%HGV, 0%Artic. 1%Cycle	81% Car, 5%Bus, 2%Motorcycle, 7%LGV, 4%HGV, 0%Artic. 1%Cycle	75% Car, 7%Bus, 4%Motorcycle, 8%LGV, 5%HGV, 0%Artic. 1%Cycle	86% Car/LGV, 5%Bus, 2%Motorcycle, 5%HGV, 0%Artic. 1%Cycle
C5.1/ Tran6a	Level of special services for the mobility impaired (Index) {15}	Very Negative	Very Negative	Neutral	Neutral
C5.1/ Tran7a	Pedestrian volume levels (Number)	3540/h peak, 2020/h off-peak	Increase of 10% pa constrained dues to footpaths	Increase of >10% pa, constraints alleviated.	Up to 15% increase seen in 2005 peak hour.
C5.1/ Tran8a	Cycle flows through inner cordon (cycles/day)	391 cycles (12hr count)	Static/reducing	Static/Increasing	576 cycles (12hr count)
C5.1/ Tran8b	Use of cycle parking facilities (%)	N/A	N/A	75%	~30% on stands, similar number parked elsewhere.
C5.1/ Econ1a	Infrastructure Purchase cost (€) {1 – 2}	N/A	N/A	€4,200,000	€4,725,000 (€1,176,000 part funded MIRACLES)
C5.1/ Econ2a	Power cost (€/year) {1 – 2}	€ 4,950	Similar to Baseline	€10,500	€14,077
C5.1/ Econ2b	Labour cost (€) {1 – 2}	€ 0	€ 0	€6,000,000	€6,750,000
C5.1/ Econ2c	Plant cost (€){1 – 2}	€ 0	€ 0	€1,800,000	€2,025,000
C5.1/ Econ3a	Maintenance cost (€){1 – 2}	€ 21,500	Similar to Baseline	€10,000	€11,760
C5.1/ Econ4a	Temporary Number employed (Number) {1 – 2}	N/A	N/A	35 people	25 people (4 MIRACLES)

N/A – Not applicable TBC – To be completed. { Meteor Core Indicator} numbers are proxy indicators as information was not available in the details requited by Meteor.*

Table 3 –Summary of Evaluation Cork MIRACLES Measure WP5.1

Table 3 shows a summary of the results for the Baseline, Do-Nothing and MIRACLES Scenarios as well as the Ex-Post 2005 results at indicator level. Additionally, Table 1 and Table 2 show the estimated pollutant concentration and the estimated annual emissions for Measure 5.1. These estimated pollutant concentrations use the UK Highways Agency (DMRB section) model which bases its calculations on traffic volumes and classification.

As can be seen from Table 1 and Table 2, the pollutant concentrations and annual emissions were expected to decrease substantially on St. Patrick's Street due to the re-design. Pollutant concentrations were expected to decrease with the implementation of the MIRACLES measure as compared to the Do-Nothing Scenario. Annual emissions were expected to decrease by a third of the Do-Nothing value. The actual effect on emissions was based on traffic volumes counts carried out in Spring 2006, the emissions (apart from CO) were lower than the predicted Do-Something values.

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Even the annual emission for CO decreased 43% on the Do-Nothing Scenario.

The measure reduced transport-related environmental impacts at the local level. These works should boost employment and increase the attractiveness of the city centre for recreation, shopping and many business pursuits (particularly service businesses). The re-design of St. Patrick's Street gave more prominence to sustainable modes of transport, with better public transport alighting facilities and cycle stands provided.

As can be seen from the results in Table 3; The *redirection of motor traffic away from the City Centre* as well as the *promotion of access to the City Centre by public transport* was monitored through the following indicators: The number of lanes (C5.1/Tran4a) was reduced by 4 lanes to 2, which achieved the target reduction of a *50% reduction in lane capacity on the main arterial route* through the city centre. The increase in journey times on this section (C5.1/Tran1a) as well as the increase in stationary time (C5.1/Tran2c) should aid in the redirection of motor traffic away from this route. The modal split (C5.1/Tran5a) on St. Patrick's Street was identified from a classified traffic count as modal split information will only be available after the Census 2006. Traffic volumes (C5.1/Tran3a) were quantified in December 2005 and February 2006 post implementation of the expansion of the Clean Zone, these showed a 33% decrease on the Baseline traffic volumes.

The City Centre Clean Zone was expected to have many beneficial effects for the pedestrians and cyclists using the City Centre, thereby *encouraging more sustainable transport patterns*. The removal of all parking spaces from St. Patrick's Street (C5.1/Tran4b) aided in the achievement of this objective. An increase in the number of pedestrians was expected (C5.1/Tran7a) and the Ex-Post surveys carried out in May 2005 shown that the figures increased substantially. In May 2005, the evening peak was 5430 pedestrians per hour, two-way count, (a 53% increase on December 2002).

The increase in cycling facilities far exceeded the 40% increase in facilities originally promised as part of the project. This drew more cyclists into the City Centre (C5.1/Tran8b) and Ex-Post surveys carried out in April 2005 confirmed both an increase in cyclist parking numbers and a very positive acceptance of the new facilities. The number of cycles parked in the City Centre increased dramatically since the survey in 2002, when only 7 cycles were recorded. An average of 55 parked cycles per day was recorded in the 2005 surveys.

It was anticipated that the environment would improve due to Measure 5.1, creating a *safer, healthier and more comfortable environment* in the City Centre, with emissions decreasing (C5.1/Env1a) as well as the perception of noise levels (C5.1/Env2a). The improvement to emissions and noise levels reductions were measured as part of user questionnaires in April 2005. Over 50% of people questioned stated that noise level were "much better" or "slightly better", despite noise level increasing slightly (3dBa, which is just noticeable). The increase in pedestrian footpath widths and crossing facilities provided as part of this Measure is expected to have a positive impact on accident rates (C5.1/Saf1a). The numbers of accident rates are so small it is difficult to calculate the impact.

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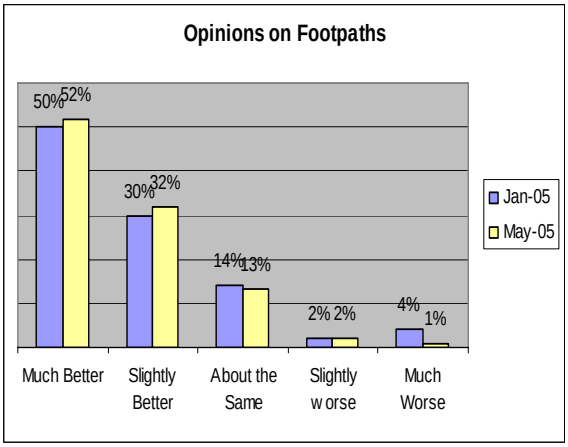
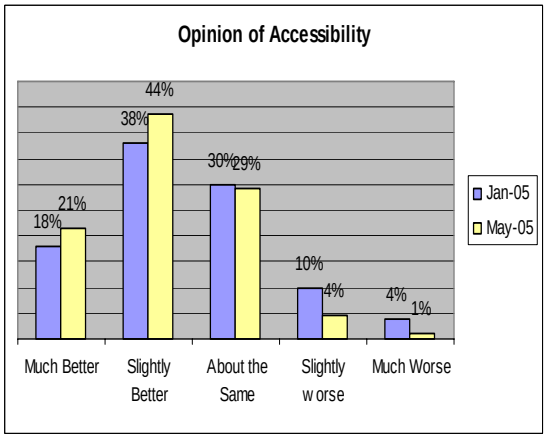




Figures 1a & 1b – User opinions on footpaths and accessibility on St. Patrick's Street.

Both the user acceptance (C5.1/Accp2a) and operator acceptance (C5.1/Accp1a) of this Measure are very positive. The "cosmopolitan" feel to the new City streetscapes was strongly supported. The 2005 user acceptance survey identified that the widening of footpaths was greeted very positively; over 80% of survey respondents rating them as "much better" or "slightly better". Opinions on accessibility to Patrick's Street were very positive with over half of respondents reporting that the facilities were "much better" or "slightly better".

The bus service operator reported additional bus service delays on St Patrick's Street and on the adjacent streets due to the reduction of the St Patrick's Street green signal times as part of the redirection of traffic. Also, some problems with bus stop size and layout. However, the principal problems resulted from the poor enforcement of loading time restrictions on delivery vehicles and on illegally parked taxis.

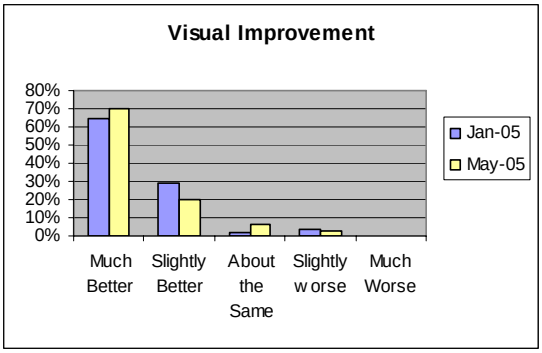
The representatives of business organisations strongly supported this measure. However, they also are not satisfied with the enforcement of the loading time restrictions and illegal parking. Restrictions on access by retractable bollards have only recently been implemented. Cork City Council is currently undertaking an urban freight management study.

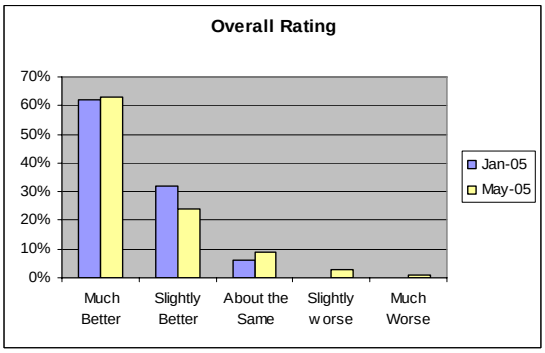
The wider pedestrian areas and the modern more disabled friendly surfaces, tactile guidance, etc. were expected to be easier and safer for the disabled. However, representatives of disabled organisations, especially the visually disabled, state that some aspects are unsatisfactory, in particular the new lamp standards and the use of steel bollards in tactile paving to prevent illegal parking. They consider that improved consultation with representatives of disabled groups is required during each aspect of the detailed design.

Opinions on the lampposts and paving were very positive with well over half of respondents reporting that the facilities were "much better" or "slightly better". The opinion of visual improvement (C5.1/Env3a) was very positive with over 90% of survey respondents rating it as "much better" or "slightly better". The overall opinion (C5.1/Accp2a) of the redesign was resoundingly positive with over 60% rating it as "much better".

MEASURE-LEVEL RESULTS

Measure title: WP5 – Access Restrictions	**Project: MIRACLES**
Measure number: 5.1 Set up of City Centre Clean Zone	**City: Cork**





Figures 2a & 2b – User opinions on visual improvement and their overall rating of St. Patrick's Street.

The predicted Do-Something costs were in line with the €13.5 million spent on St. Patrick's Street.

In summary, this measure is considered to have been very successful and to have met its objectives. The redesign created space for cultural events and recreational activities which have since attracted many visitors to the city centre. The CIVITAS funding provided a catalyst both for the implementation and the expansion of the original scheme. It is suggested that restricting all motor traffic except public transport, taxis and delivery vehicles would be desirable.

Initially just St. Patrick's Street was to be re-designed, however in 2004 the Clean Zone was extended to include Oliver Plunkett Street and the upper section of the Grand Parade. Thus, the potential to up-scale this Measure to a larger area of the City Centre was achieved during the course of this project. Post MIRACLES the Clean Zone will be retained and due to its success expanded to a further adjacent area.

Lessons Learned – what do other cities, other actors and the EC have to consider?

M12: Barriers and drivers of the measure implementation / Process evaluation

The St. Patrick's Street project was being driven by a series of plans to enhance the city's cultural/recreational, commercial and environmental characteristics. These include: The Cork Area Strategic Plan, which will guide the sustainable development of Cork City Region up until 2020. Of relevance to WP 5 is that CASP literature plans for regular investment in the development of an integrated transport system spread over 20 years. The aim is to achieve "a modal shift from car-based to public transport of up to 27% of all City Centre trips" and to ensure that "Urban renewal will continue in the City Centre". This "reflects the national spatial planning guidance contained in the National Spatial Strategy (NSS) and the National Development Plan (NDP)." Thus these documents may also be regarded as drivers for the creation of an inner city clean zone.

Other key drivers include the City Development Plans (1998, 2003) and the preparations for Cork as European City of Culture in 2005. The redevelopment of the City Centre (and St. Patrick's Street in particular), has been progressed rapidly in preparation for this, because it created a key space for cultural events and helped to make Cork a more attractive place for tourists to shop.

Barriers to the progress of WP5 have included the desire for minimal disruption to street trade during construction works, the need to co-ordinate road closures arising from Clean Zone refurbishment and the Cork Main Drainage Project (over 17 kilometres of new foul sewers were laid, using a variety of construction techniques in the City Central Island's streets).

Other difficulties associated with WP5 arose from the complexity of the works to be carried out and the many conflicting interested parties influencing the prioritisation of works to be progressed. This has meant that much of the electrical works associated with MIRACLES supported improvements (for example: pedestrian crossings and retractable bollards) have been delayed where practical in order to complete the surface works as quickly as possible. The chosen bollard design should minimise the

MEASURE-LEVEL RESULTS	
Measure title: WP5 – Access Restrictions	**Project: MIRACLES**
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risk of accidents during the raising of the bollards. Some objections have also been raised since the piloting of the bollards and discussions with all parties is ongoing.

There were also some minor legal hurdles to be overcome regarding the enforcement of access restrictions on the streets identified for the installation of automatic bollards. These were successfully addressed by the City Council's Legal Department.

M13: Interrelationships with other measures

The access restrictions on St. Patrick's Street have been complimented by better facilities for pedestrians and cyclists, which contributed to the fulfillment of the objectives of Task 10.1. Another soft measure, which has been supported by the access restrictions, is the staff mobility management initiative (Task 10.2). Because the access restrictions encouraged people to reappraise their travel arrangements, they became more inclined to consider car-pooling and other options to reduce their dependency on private car usage. The Park and Ride scheme (Task 7.3) has been particularly useful for people wishing to access the clean zone for work or recreation- particularly for events such as the official opening of different phases of the street works and other events which closed off the clean zone to cars; such as the Awakening Ceremony to inaugurate Cork's Reign as European Capital of Culture in 2005, when park and ride operating hours were extended to accommodate the peak demand on the day. The Clean Zone has also been closed annually to mark European Car Free Day during which, Clean Vehicles (WP 12) were also promoted in accordance with the European guidelines for the Day. There was a display of Clean Vehicles in the Clean Zone in 2002.

M14: Lessons learned

The creation of a city centre clean zone is worth pursuing where the city in question is keen to improve its attractiveness to tourists and shoppers.

The primary benefits of WP5 measures are as follows:

1. It would seem to make the city centre safer. It was considered that the wider pedestrian areas and the modern more disabled friendly surfaces and tactile guidance etc. would make it easier and safer for the disabled. The crime figures for Patrick's Street from 2002 to 2004 were examined by the police and these figures showed that personal assaults were down by 33%.

2. The new street layout is more attractive to pedestrians of all abilities. The user survey results. (90% of respondents thought Patrick's Street looked better; 84% thought preferred the new pavements and 64% thought they made the city centre more accessible).

3. It promotes inner city shopping and tourist trade. The pedestrian footfall counts on Patrick's Street pre and post MIRACLES demonstrate an increase in pedestrian numbers. (Up to a 15% increase per annum in the peak hour)

4. It created extra space for hosting cultural events/recreational activities (e.g. a street fair was held on the new streetscape to mark the "Day of Welcomes", when Cork celebrated the expansion of the EU).This can be objectively witnessed by the many visitors to the city centre during the many open air cultural events hosted on the street.

5. The perception of air and noise pollution within the city centre should be reduced, which should particularly benefit on-street traders and buskers and this in turn should further encourage people to relax, sit, talk or enjoy entertainment on the street.

The lessons learned from the implementation of WP5 activities in Cork were:

1. It is very important to ensure that there is a clear designation and appropriate delegation of responsibility for the different types of change to be incorporated in a project of this complexity. This is particularly important for innovative measure –such as the introduction of automatic bollards.

2. Alternative traffic routing should be made available before, during and after construction/installation

MEASURE-LEVEL RESULTS	
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works.

3. Regular meetings and site visits are another important way of ensuring that works are carried out in the best interests of all concerned.

4. Any possible legal issues arising from any of the proposed measures should be investigated as early as possible.

5. All elements of the streetscape should be assessed in terms of the potential hazard they might pose to those with visual or other impairments.

6. Street signs should be installed in a manner that makes them easy to replace/repair should the need arise.

7. Future construction works in the Clean Zone should be curtailed by encouraging local utility companies to complete any upgrades envisaged over the medium term (10 years in this case) prior to the commencement of City Centre Refurbishment works.

8. Advantage should be taken of the opportunity afforded by street resurfacing to install innovative infrastructure, such as electrical supply sockets for festive lighting.

9. The use of easily repaired paving blocks should be considered so that when the pavements need to be dug up again the blocks can be replaced without disrupting the smoothness of the level surface. (This has been successfully tested in St. Patrick's Street.)

10. The layout of underground services should be carefully assessed before installing automatic access restriction bollards bearing in mind the possible negative interactions between the technology to be installed and existing or proposed installations for this area.

Contact Point

.www.corkcity.ie/services/depts/dept_road_miracles.html

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3. Measure 7.3

MEASURE-LEVEL RESULTS	
Measure title: Introduction of New Lines	**Project: MIRACLES**
Measure number: 7.3 Park and Ride	**City: Cork**

The Measure – what is it about?

M1: Measure objectives:

The objectives of Measure 7.3 were to:

- Reduce the volume of motor traffic coming into the city from the southeast.
- Provide at least 450 Park and Ride spaces at a new facility at Blackash.
- Achieve and maintain Park and Ride patronage at near full capacity.
- Encourage families to use public transport together, by offering a cheaper alternative to the regular public transport services on offer to families.
- Lessen the demands on inner city parking.
- Encourage people to abandon the motor car entirely, in favour of "cycle and ride" (or walk and ride).
- Integrate the new ring road system with public transport into the city.

M2: Measure description:

A new Park and Ride was established at an 8 acre contaminated site at the Black Ash/South City Link Road. This was located approximately 3.3 kilometres southeast of the City Centre and was originally intended to provide at least 450 parking spaces. The plans were later expanded to develop a site providing approximately 900 Park and Ride spaces.

With the aid of CIVITAS funding, features which Cork City Council planned to include at this facility were: Variable Message Signs (VMS) on the approaches-to promote the Park and Ride facility, security fencing, CCTV surveillance systems, entry/exit control barriers, landscaped parking areas, pedestrian walkways, lighting signage etc. The inclusion of some of these features (particularly VMS and the pedestrian walkways) was largely dependent on part funding from CIVITAS. MIRACLES also helped to promote the whole development in the context of trying to encourage a more sustainable modal split.

The Implementation – how was the measure implemented?

M3: Innovative aspects:

Park and Ride is a relatively new concept in Ireland, Cork was the first city to provide a Park and Ride facility. Particularly relevant to CIVITAS was the use of VMS, which were on the ring roads skirting the site-as well as on other approaches. These signs played an important role in integrating the ring roads and public transport systems. The Park and Ride site also featured secure bicycle parking facilities. Such facilities had not previously been provided at any bus stops or bus stations in the City.

M4: Situation before CIVITAS:

A Park and Ride service had been in operation since December 1997 from a site approximately 2.2 kilometres west of the city centre, with limited capacity. It was introduced to ease city centre congestion during the Christmas Shopping Season. It was then extended to operate every Saturday all year round, average patronage of 300users/day. This facility was closed in 2004 due to development. Without Measure 7.3, no Park and Ride facility would have operated in Cork since 2004.

M5: Design of the measure:

The original plan for the site development was as follows:

1. Design and construction of Park and Ride site
2. Procurement of VMS on the approaches to promote the Park and Ride facility.

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Measure title: Introduction of New Lines	**Project: MIRACLES**
Measure number: 7.3 Park and Ride	**City: Cork**

3. Provide the following facilities on site: security fencing, CCTV surveillance system, entry /exit control barriers, landscaped parking areas, lighting and signage.
4. Install cycle parking facilities within the new Park and Ride site.
5. Provision of safe pedestrian access (walkway) to the site.
6. Promote and market Park and Ride Facility.
7. Achieve and maintain Park and Ride patronage at near full capacity.

M6: Actual implementation:

Following the initial application for CIVITAS funding, Cork City Council sought expressions of interest in the development of a Park and Ride Facility at the Blackash, Cork, as a public private partnership, with minimum requirements: surface level parking for 600 cars, with potential expansion to 900 spaces; and the operation of a Park and Ride scheme, providing supervised parking and transport by bus to/from the city at 10 minute peak frequency, 15/20 minute off peak frequency. With the aid of CIVITAS funding it was envisaged that the site would also include: Variable Message Signs (VMS) on the approaches-to promote the Park and Ride Facility, Security Fencing, CCTV Surveillance Systems, Entry/Exit Control Barriers, Landscaped Parking Areas, Pedestrian Walkways, Lighting Signage, etc.

Internal disagreements, unrelated to the MIRACLES project, resulted in the disruption of the private partnership and the City Council decided to develop the site independently. An initial feasibility study was carried out.

In 2003, City Council proposed the construction of Phase 1 of the Park and Ride Facility at Blackash. In accordance with Part 8 of the Local Government (Planning & Development) Regulations 2001, three companies were invited to submit design proposals for the site, one of whom were subsequently selected and appointed as project managers and chief design engineers. “Prequalification Notices” were then published in the press, seeking contractors for the Phase 1 construction works. (Phase 1 of the project could provide up to: 380 standard car spaces (5m x 2.5m), 9 disabled car spaces (5m x 3.75m), 9 motorbike spaces and 48 cycle spaces. It also included the construction of an administration building, the installation of entry/exit gates, the erection of route map displays, landscaping etc.) The project was located on top of a former landfill site and part of the works for developing the site as a Park and Ride facility would require the containment, collection and safe treatment of the emissions from the waste.

Following the initial design, a preliminary public consultation process was entered into to further inform the design process. Key governmental and non-governmental organisations were written to and provided with outline details of the proposed development. Feedback received was taken into consideration and replied to as appropriate. A site investigation was initiated in mid 2003, along the southern boundary of the site, to establish the best method of soil stabilisation and earth retention. In July, 2003 a planning application was made for the construction of Phase 2 of the Park and Ride which would involve expansion of the number of vehicle parking spaces to around 910, as well as further development of pedestrian access, etc. Also in July 2003, the “Call for Tenders for the Operation of the Park and Ride Facility” was published.

The first phase of the site was opened to the public on 29th of November 2003, providing 250 car park spaces. The number of car park spaces increased to 410 by February 2004, including 4 disabled driver parking bays and provision for bicycle parking. The opening was launched with an intensive and prolonged media campaign, featuring daily local radio advertisements, inclusion in national traffic reports, advertisements and press releases issued to local and national newspapers, the installation of VMS and other parking guidance signs on the approach roads in the vicinity of the Park and Ride site. By the end of July, 2004, the site was capable of providing up to 600 spaces and the numbers of bus passengers using the service was rising steadily. The administration building was completed by the end of September 2004 and all other works were in place by October 2004. Special Park and Ride

MEASURE-LEVEL RESULTS

Measure title: Introduction of New Lines	**Project: MIRACLES**
Measure number: 7.3 Park and Ride	**City: Cork**

promotions in the run up to the Christmas period increased the usage of the Park and Ride.

Up-scaling of this measure is possible due to its continued success. A second Park and Ride site has been identified following the success of Blackash Park and Ride, which will accommodate up to 500 vehicles on the North side of Cork city.

M7: Deviations from the plan:

There were some delays due to the investigation of a possible public private partnership. Ultimately, Cork City Council decided to develop the site independently. The site was a contaminated site adjacent to an existing landfill site, so, following an initial feasibility study, it was thought that a joint application for EPA licensing would be made for the Park and Ride Site and the Landfill Site. However the Environmental Protection Agency advised that it would be better to split the licences into separate applications; this proved successful.

In 2003, the City Council proposed the construction of Phase 1 of the Park and Ride Facility at the Blackash Road, Cork, in accordance with Part 8 of the Local Government (Planning & Development) Regulations 2001.It was originally intended to provide at least 450 parking spaces. The plans were expanded in 2004 to provide over 900 Park and Ride spaces at this facility.

The Evaluation – how was it done and what are the results?

M8: Method of measurement:

Various tools were used to evaluate the 26 performance indicators for this measure. Survey work took place between June and December 2002 to establish the Baseline Scenario which included journey time surveys. Further information was gathered from data sources such as annual air pollution reports, accident records and annual classified traffic counts. The frequency of measurement and the exact source of data are detailed both in the Cork Local Annex (Deliverable 4.1) and in the Cork Baseline 2002 Report which is available on request.

Survey work was repeated in 2003, 2004 and 2005 to monitor the Ex-Post situation. On-site parking surveys, patronage records, journey time and headway surveys, user acceptance and operator acceptance surveys were carried out. Further information was gathered from data sources such as annual air pollution reports, accident records and annual classified traffic counts. Records and drawings provided by Cork City Council provided information on financial matters and the change in derelict area. Interviews and questionnaire surveys provided information on the acceptance views of users and operators. The frequency of measurement and exact source of data is detailed in the Cork Local Annex (Deliverable 4.1). Further details can be found in the Cork Ex-Ante Report which details of the individual surveys can be found in the additional measure level reports which are available on request.

M9: Achievement of quantifiable targets:

450 Park and Ride spaces were originally planned, but over 900 spaces were actually provided. By October 2005, the daily patronage was of the order of 500 vehicles/day, saving approximately 475/450 trips each way to the City Centre. The presence of the Park and Ride facility not only lessens the demand on inner city parking but also encourages the use of more sustainable modes of transport.

The provision of cycle parking and pedestrian access ways may also encourage people to abandon the motor car entirely, in favour of “cycle and ride” or “walk and ride”. Families and car sharing was encouraged by the use of “free passenger tickets”. The awareness raising activities undertaken for CIVITAS played an important role in promoting the use of Park and Ride, the VMS signs in particular were important tools. The quality of the Park and Ride service was rated by user opinion questionnaires as 83% “Very Good”, with the remaining 17% rating it as “Good” or “Satisfactory”. 99% of survey respondents said that they would use Park and Ride again.

MEASURE-LEVEL RESULTS

Measure title: Introduction of New Lines | **Project: MIRACLES**

Measure number: 7.3 Park and Ride | **City: Cork**

M10: Achievement of evaluation-related milestones:

- The establishment of the 2002 Baseline evaluation took place in December 2002. This established a 'before' scenario for the Measure. This information included journey time surveys, modal split, emissions and accidents.
- Monitoring of the impacts throughout the implementation of the Measure included a user acceptance questionnaire in December 2003 and the collection of quantitative information such as patronage figures. Annual reports on air pollution, accident rates and traffic volumes were also compiled throughout the course of the project.
- Monitoring continued in 2004 with performance indicators for environmental, acceptance and transport quantified in February and in September.
- Finally, the ex-post surveys were carried out in April and September 2005.

Detailed Gantt charts showing the frequency of measurement of each indicator can be found in the Cork Local Annex (Deliverable 4.1).

M11: Report on the measure results:

The performance indicators for the evaluation of Measure 7.3 are broken into 5 sections; Economy, Environment, Safety, Acceptance and Transport. Many of these indicators are evaluated using both quantitative and qualitative data collection methods. A full explanation of the indicators and how they were quantified for the 2002 Baseline Scenario is available in the Cork Baseline Report. Similarly for the Ex-Ante evaluation, a full explanation of the indicators and how they were quantified for the Do-Nothing and MIRACLES (Do-Something) Scenarios in 2006 is contained in the Cork Ex-Ante Report which is available on request.

Table 3 shows a summary of the results for the Baseline, Do-Nothing and MIRACLES Scenarios as well as the Ex-Post 2005 results at indicator level. Table 1 and Table 2 show the estimated pollutant concentration and the estimated annual emissions on the South Link Road, which runs adjacent to the Park and Ride site and is the main arterial road from the South leading into the City. These estimated pollutant concentrations make use of the UK Highways Agency (DMRB section) model which bases its calculations on traffic volumes and classification. It was estimated that the environment would improve due to Measure 7.3, with emissions decreasing (C7.3/Env1a) as well as a reduction in the derelict area (C7.3/Env2a). The 2005 Ex-Post results are higher than anticipated due to the higher than predicted increase on traffic volumes (over 16%) on this route due to adjacent road schemes. The Park and Ride has helped in reducing emissions by lowering the traffic volume on this busy route.

Name	Year	CO	Benzene	1,3-butadiene	NO_x	NO_2	PM_{10}	
		Annual mean mg/m^3	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Days >50$\mu g/m^3$
Baseline	2002	1.05	1.14	1.10	41.33	12.08	4.80	0.00
Do Nothing	2006	0.72	0.88	0.71	30.72	9.70	3.76	0.00
MIRACLES	2006	0.72	0.87	0.70	29.90	9.51	3.68	0.00
Ex-Post	2005	0.73	0.89	0.76	38.68	11.45	4.36	0.00

Table 1 Park and Ride – Estimated pollutant concentrations using DMRB Screening Method

Link title	Year	Emissions				
		CO	THC	NO_x	PM_{10}	CO_2
		(kg/year)	(kg/year)	(kg/year)	(kg/year)	(tonnes/year)
Baseline	2002	58822	8761	40990	1164	7325
Do Nothing	2006	71647	10722	46936	1372	8552
MIRACLES	2006	66794	9995	43757	1279	7972
Ex-Post	2005	81076	12735	62379	1791	10576

Table 2 Park and Ride - Estimated annual emissions using DMRB Screening Method.

MEASURE-LEVEL RESULTS

Measure title: Introduction of New Lines | **Project: MIRACLES**

Measure number: 7.3 Park and Ride | **City: Cork**

WP 7.3 Blackash Park and Ride Evaluation

Indicator (Units) {*Meteor Core Ind}		Baseline 2002	Do Nothing 2006	MIRACLES 2006	Ex-Post 2005
C7.3/ Env1a	Emissions [CO2,CO, PM10,NOX] (ug/m^3) {5-11}	Tables 1 & 2	Tables 1 & 2	Tables 1 & 2	Tables 1 & 2
C7.3/ Env2a	Change in derelict area (Hectares)	N/A	N/A	3.28 Hectares	3.28 Hectares
C7.3/ Env3a	Change in total fuel use (number of trips) {3-4}	N/A	N/A	~400 trips saved each way/day	475/450 trips saved each way/day
C7.3/ Saf1a	Accidents (No of acc/year){20}	6 Casualties, 8 vehicles	Similar to Baseline	Slight reduction to Do-Nothing	4 Casualties, 4 vehicles
C7.3/ Saf2a	Safety rating on site (Index) {17}	N/A	N/A	Positive	85% Very Positive
C7.3/ Saf2b	Incident levels (Number/year) {17}	N/A	N/A	0	0
C7.3/ Accp1a	Operator acceptance rating (Index) {13-14}	N/A	N/A	Positive	Very Positive
C7.3/ Accp2a	User acceptance rating (Index) {13-14}	N/A	N/A	Very Positive	83% Very Positive
C7.3/ Tran1a	Journey time (Minutes) {23-24}	10 mins peak, 7 mins offpeak	Increase on Baseline	Slight decrease on Do-Nothing	10 mins peak, 7 mins offpeak
C7.3/ Tran2a	Passenger capacity (number of seats/day)	N/A	N/A	9,794 seats/day	9,794 seats/day
C7.3/ Tran2b	Parking spaces (Number)	0	0	450 spaces	900 spaces
C7.3/ Tran2c	Patronage (pax/day)	0	0	450 passengers/ day	Average 475/500 passengers/day
C7.3/ Tran3a	Passenger load factors(%)	N/A	N/A	60%	Approximately 54% of parking capacity
C7.3/ Tran4a	Average modal split (% by mode) {26 -27}	34% walk, 2% cycle, 10% bus, 1% motorcycle, 52% car	Similar to Baseline	Change towards more sustainable modes	To be completed by Census information 2006
C7.3/ Tran5a	Information sites (Number)	N/A	N/A	Numerous sources.	Numerous sources
C7.3/ Tran5b	Information accessibility (Index)	N/A	N/A	Very Positive	70% Very Positive
C7.3/ Tran6a	Average headway (Minutes) {18}	N/A	N/A	15 mins offpeak, 10 mins peak	15 mins offpeak, 8 mins peak
C7.3/ Tran7a	Variability of arrival times (Minutes) {18}	N/A	N/A	Very rare, congestion might effect this.	Very rare
C7.3/ Tran7b	Variability of journey times (Minutes) {18}	3 mins inbound,4 mins outbound	Increase to Baseline	Slight decrease on Do-Nothing	Approximately 5 minutes
C7.3/ Econ1a	Infrastructure Purchase cost (€) {1-2}	N/A	N/A	€5.2 million	€6.3 million
C7.3/ Econ2a	Power cost (€/year) {1-2}	N/A	N/A	€18,000	~ €40,000
C7.3/ Econ2b	Contract cost (€){ 1-2}	N/A	N/A	€1.6 million over 3 years	€1.8 million over 3 years

MEASURE-LEVEL RESULTS

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C7.3/ Econ3a	Maintenance cost (€) {1-2}	N/A	N/A	€75,000	€75,000
C7.3/ Econ4a	Subsidy (bus) (€/km/year) {1-2}	N/A	N/A	€0	€0
C7.3/ Econ5a	Temporary Number employed (Number)	N/A	N/A	0 people	0 people
C7.3/ Econ6a	Long term Number employed (Number)	N/A	N/A	5 people	5 people

N/A – Not applicable. {Meteor Core Indicator} numbers are proxy indicators as information was not available in the details requited by Meteor.*

Table 3 Summary of indicator results for Measure 7.3

As can be seen from the results in Table 3, the Park and Ride project was expected to have many beneficial effects in the *encouragement of sustainable modes of transport*. It was estimated that 475/450 trips (C7.3/Env3a) each way to the City Centre would be saved by the provision of this Park and Ride facility. The patronage of the Park and Ride site in October 2005 was in the order of 500 vehicles a day and is predicted to increase steadily. This level of usage covers the current operating costs. It also influences the safety indicator (C7.3/Saf1a), where a *reduction in traffic volumes on one of the main arterial roads* to the city centre should lead to a reduction in accidents, as can be seen from the small numbers of accidents it is difficult to determine the impact.

An objective of this Measure was to *lessen the demands on inner city parking*. From the Ex-Post surveys in April 2005, instead of using the Park and Ride facility, 31% would have parked in a multi-story car park, 24% would have parked in the suburbs and walked and 12% would have used disc-parking. At present over 450/475 people use the Park and Ride daily, this number is expected to grow over time. With the increase in Park and Ride numbers, the demand on inner city parking should reduce because of this Measure.

The user acceptance (7.3/Accp2a) and operator acceptance (C7.3/Accp1a) of this Measure were very positive. These were examined through the Ex-Post User Opinion Questionnaire. It was found that 90% of respondents were drivers and 9% were passengers. The female usage of the Park and Ride is very high (72%) and 71% of respondents were travelling alone.

Over half of the vehicles (54%) were parked for longer than 7 hours and the main purpose of the trips was work (76%) followed by shopping (10%), personnel business (10%), tourism (1%) and other (10% mostly students/college). 63% of the respondents used the Park and Ride service more than 3 days a week. Only 2% were first time users.

The disabled parking spaces and the cycling stands provided were only used to a very limited extent, the provision of increased facilities in the city centre for these two groups may have affected the uptake at the Park and Ride facility.

Sources of Park and Ride information were examined with advertising signs (37%) and word of mouth (38%) the most prominent; the ease of finding out about Park and Ride (C7.3/Tran5b) is very positive with 96% rating it as Very Good, Good or Satisfactory.

The perception of security (C7.3/Saf2a) is 85% Very Good with the remaining 15 % being Good or Satisfactory. No incidents (C7.3/Saf2b) have been recorded since the opening of the Park and Ride site.

Park and Ride buses are scheduled to depart every 10 minutes in peak hours and every 15 minutes during off-peak hours. Surveys were carried out in April 2005 to monitor headway times (C7.3/Tran6a). During off peak hours, buses were recorded as leaving every 15 minutes. For the peak periods buses left on average every 8 minutes. Also the frequency of bus service was rated by 100% as Very Good to Satisfactory. Journey times (C7.3/Tran1a) were surveyed in April 2005: the

MEASURE-LEVEL RESULTS

Measure title: Introduction of New Lines	Project: MIRACLES
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mean time was 7 minutes which can increase by an additional 5 minutes during peak periods. Peak hour delays at the city end may soon require the implementation of bus priority which is included in the design of this measure but not yet implemented. Some bus priority measures were installed in late 2005 associated with the adjacent Green Route, the Park and Ride service for the most part operates along this Green Route.

The overall quality (C7.3/Accp2a) of the Park and Ride service was rated by 83% as "Very Good", with the remaining 17% rating it as "Good" or "Satisfactory". 99% of survey respondents said that they would use Park and Ride again.

Contract costs are €1.8 million over 3 years, power costs are approximately €40,000 per year and maintenance costs €75,000 per year. 5 people are employed on a long term basis for this Measure. It is hoped that no operating subsidy will be required for this Measure as it aims to be self-financing. Revenue comes from the user paying €5 per day for use of the service (Park and Ride bus, parking and up to 4 passengers included). After the first 50 weeks of operation by November 2004, these revenue streams were sufficient to match the weekly running costs. However higher operational costs were predicted for 2005 in anticipation of rising gas and electricity costs. For the first six months of the year income was around 20% lower than predicted running costs. In September weekly revenue began to match predicted expenditure and it is expected that the cumulative shortfall will be less than 6% by end of year.

The Blackash Park and Ride has been greeted in Cork very positively with the number of users steadily increasing and the prominent use of the green Park and Ride buses a ready reminder of more sustainable modes of transport. The continued monitoring of the service as well as frequent user surveys have established a good relationship with users, these have also provided useful information in terms of possible problem areas and identification of areas that are working well.

Efforts will be needed to secure further patronage of the service, and the continuing media campaigns and focus on business will aid in this, as would longer opening hours. Block selling to business at discount rates and further technological advances such as ticketing integration should be investigated. Furthermore an increase the number of shoppers could be achieved by further advertisement and considering short duration ticket at a reduced cost.

In summary, this measure is considered to be very successful both by users and operators. Although it was not possible to separately identify the impact of the CIVITAS funding, it acted as a catalyst which greatly contributed to the success of the measure.

Due to the success of this measure Cork City Council are committed to continuing the P&R service at Blackash as well as providing a second P&R site (accommodating up to 500 vehicles) on the North side of Cork City in 2006. Up-scaling of this measure is possible due to its continued success; This will counterbalance the existing Blackash Park and Ride site located to the South of the City Centre on a main arterial route. During the course of the MIRACLES evaluation, many users expressed a desire for such a second Park and Ride site. Buses similar to that of the distinctive green MIRACLES Park and Ride buses will be used and joint promotion and advertising will be carried out. Many of the lessons learnt and experience gained through the MIRACLES project will be used in the implementation of this second Park and Ride facility. Political commitment has also been given to the Park and Ride project on the North of the city. This is reinforced by existing plans, which called for a Park and Ride on the North side of the City in accordance with the Cork Area Strategic Plan.

Lessons Learned – what do other cities, other actors and the EC have to consider?

M12: Barriers and drivers of the measure implementation / Process evaluation

Initially, there was a delay in the provision of new Park and Ride facilities caused by problems in the licensing of building on contaminated land and the provision of finance. Licensing issues were overcome as a result of discussions with the Environmental Protection Agency and a managerial

MEASURE-LEVEL RESULTS

Measure title: Introduction of New Lines	**Project: MIRACLES**
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decision to develop the project in 2 phases. Concerns about adverse financial contingencies were allayed by successful application to the appropriate national bodies for funding.

There was also a risk that the new Park and Ride site would not attract sufficient passenger volumes. Consequently, much thought and care was put into: site selection, marketing plans via diverse media, including radio, newspaper, VMS, parking guidance signs etc. and integrating the Park and Ride with other measures-such as (WP11.2) Park by Phone, (WP 10.2) mobility management and awareness measures. By September 2005, there were approximately 400 users of the Park and Ride per day, with numbers in the pre-Christmas period far exceeding this. The reliability of the service has drawn frequent users with many commuters using the service.

The most significant driver of the measure was the Cork Area Strategic Plan which is a plan for the sustainable development of the greater Cork area until 2020. It includes specific references to developing Park and Ride sites.

M13: Interrelationships with other measures

The access restrictions proposed for the city centre (WP5.1), reinforced the need for commuters to consider alternatives to individual car use. They also served as a motivational factor, encouraging people to avail of the service.

The promotional activities associated with the improvements to the Park and Ride Services were also used to promote other aspects of CIVITAS/MIRACLES such as the improvements to facilities for cyclists/pedestrians, activity WP10.1 (particularly in conjunction with European Mobility Week).

This measure also contributed to the objective to introduce added value integrated services as the New Park and Ride service was integrated with measures to facilitate bus prioritization and the provision of Green Routes for safer use of public transport, cycling and walking. It also intended to integrate this measure with 11.2 by allowing Park and Ride users to pay using their phones.

M14: Lessons learned

Cork City Council has been providing information to other Irish local authorities to help them initiate and operate similar Park and Ride facilities. Other CIVITAS cities, particularly CIVITAS 2 cities have expressed interest in the Cork experience and the entry of the Park and Ride in the National Transport Awards for the “British Isles” is further evidence of Cork City Council’s desire to share information about the development to a wide audience. The Cork experience should be particularly interesting for municipalities with no previous public transport operation experience.

It was found that cost of the Park and Ride service is a significant factor. Users of the Park and Ride service should be offered a significant saving compared with inner city parking for long stay parkers. (In Cork users start saving if they park for over 2 hours and even greater savings if they availed of discounted monthly or annual tickets). 56% of users surveyed in 2004 cited the cheaper price as the reason for using Park and Ride. Limited parking space in the city centre was the next most important incentive. However, it was observed that for 20% of users, price and parking availability were not of such concern; for them, speed and ease of travel (stress avoidance) were more important.

Efforts made to make the journey more relaxing included high comfort seating layouts, regular bus cleaning and the provision of complimentary newspapers, drink vending machines and well serviced toilets in the waiting areas. The speed of the bus service was one of the key operator performance indicators and minimum journey times were achieved by careful route and site selection, as well as bus prioritisation at traffic lights and junctions. Further efforts in improving journey times as buses approach the city centre will be needed in the future to counteract the worsening effects of congestion over time.

Advertising of the scheme is vital, with road signs, newspaper advertisements and radio adverts found to be effective. The City Council also ran a number of “free days” on which usage peaked and which

MEASURE-LEVEL RESULTS

Measure title: Introduction of New Lines	**Project: MIRACLES**
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attracted new customers. After each of these days the number of car drivers availing of the service began to increase at a steeper rate for about 10 weeks.

Cork City Council also learned that the operating costs should be carefully minimised through clever design. Trying to balance operating costs and income will become increasingly difficult in Cork if energy costs continue to rise as predicted. For future Park and Ride sites, Cork City Council will investigate the possibilities for installing new energy heating systems and other highly energy efficient designs and technologies. Some ticketing problems existed during the implementation of this measure.

The development of this Park and Ride service in Cork was delayed initially because it was intended to form a public private partnership and there were problems with the private partner unrelated to the Park and Ride. However, ownership of site and service generates revenues for the Council and affords it greater control and better understanding of how to optimise the service and integrate it with complimentary Council activities/objectives.

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4. Measure 10.1

MEASURE-LEVEL RESULTS	
Measure title: Awareness Measures	**Project: MIRACLES**
Measure number: 10.1 Awareness Measures	**City: Cork**

The Measure – what is it about?

M1: Measure objectives:

The overall objective of Measure 10.1 was to raise awareness about sustainable transport modes through the provision of facilities, which highlight and cater for the needs of cyclists and pedestrians.

In particular it was intended to:

- Provide safer routes for cyclists and pedestrians accessing the city.
- Provide secure places for cycles to be locked, in locations that provide the most benefit for cyclists and nearby residents/businesses.
- Provide for the sustainable integration of cycling and walking with other urban transportation systems.
- Raise awareness about sustainable transport issues.
- Facilitate and encourage more sustainable commuting practices.
- Invite, assess and respond to feedback about measures to promote sustainable transport.
- Provide safer routes for cyclists and pedestrians accessing the city.
- Increase the numbers of cycle parking facilities within the city centre by at least 40%
- Increase the numbers of cyclists in the city centre by at least 10%,

M2: Measure description:

This measure encouraged more sustainable transport choices through publicity campaigns (e.g. in conjunction with European Car Free Day), the design of infrastructure and the provision of facilities in consultation with specific user groups and the implementation of bye-laws and incorporation of plans to encourage cycling and walking (e.g. designating pedestrian priority areas, ensuring that all future planning applications must provide for cycle parking contributions). Other relevant Measures to improve conditions for pedestrians, such as improvements to the footpaths were carried out simultaneously as part of Measure 5.1.

The Implementation – how was the measure implemented?

M3: Innovative aspects:

Cycleways are a relatively new phenomenon in Ireland, only really introduced into Cork in the two years prior to MIRACLES. Within the project, it was proposed to support the design, promotion and aspects of the implementation of a comprehensive network of cycleways and cycle parking facilities. This was a radical change for a city where designated cycle parking could only accommodate 8 cycles pre-MIRACLES and where cycle lanes were disconnected and unsupported by junction treatments like advanced stop lines. This Measure intended to correct this imbalance by supporting consultative design processes and cycleway infrastructure at junctions, etc.

An integral part of the proposal was the early identification of and consultation with those likely to use or be affected by the system. This was perceived as quite an innovation for a local authority, which traditionally has tended to engage the public at a much more advanced stage in the design of local civil works.

The streets in Cork are often far too narrow to accommodate conventional cycle paths and therefore it

MEASURE-LEVEL RESULTS	
Measure title: Awareness Measures	**Project: MIRACLES**
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was envisaged that there could be difficulties educating the public about, and legally enforcing, cycleway markings such as advanced stop lines, etc.

M4: Situation before CIVITAS:

Cycling was used extensively as a method of transport on the south side of the city especially to Cork Institute of Technology and University College Cork (UCC). Some paths suitable for cycle use were provided in the city; principally in an area of the southwest city suburbs located between the two major third level colleges. A major crossing over the South Ring Road also included a reservation for cyclists.

A more extensive cycleway network was envisaged in several earlier development plans for the city and an updated cycleway strategy for the city had been prepared by UCC. Prior to MIRACLES, however, lack of adequate funding had greatly hampered the implementation of significant improvements for cyclists. CIVITAS funding provided much needed momentum to help realise these plans.

There were other physical and possibly legislative obstacles impeding the implementation of a comprehensive cycleway network and cycling facilities in the city. For example, many of the streets are simply too narrow to accommodate a cycle path and there were only 4 stands for 8 cycles in the city centre in 2002, this number had never previously been quantified.

Pedestrian crossings in the city centre were fewer, narrower, with less provision for the blind and physically challenged. Some of the side streets off of St. Patrick's Street were pedestrianised, but the city centre was visibly dominated by the car and little was being done to promote cycling or walking.

M5: Design of the measure:

This task was designed to promote and facilitate more sustainable transport by:

1. Improving routes for pedestrians and cyclists. This involved consultation with cyclists and pedestrian access groups, an assessment of existing routes to ascertain their utility (i.e. where do they lead to/why do people use them); identification of routes which need to be linked up, improving the surfaces/lighting/signage of paths and cycle tracks where they were most needed for reasons of safety, etc.; improving facilities at road junctions and crossings to make them safer for non-motorised traffic to negotiate and providing more secure cycle parking facilities in city centre locations that provide the most benefit for cyclists and nearby residents/businesses.
2. Encouraging more people to walk/cycle or use public transport through a consultative development and marketing process.
3. Participation in awareness raising initiatives like 'In Town Without My Car Day', the promotion of Walk to School schemes, Schools Competitions on the theme of sustainable transport, etc.

Initially, Cork City Council staff reviewed previous plans and studies on the facilitation of cycling and walking within the city and compared them with best practice in other European Cities, particularly CIVITAS partners. Existing cycle parking patterns and attitudes to sustainable transport were surveyed at an early stage in the project. The public were asked to make submissions about cycling in the city. Feedback was solicited from cycling representatives following the installation of new cycle stands and this would be used to plan future cycle parking design. Subsequently, consultants were invited to tender for the design of a Cork City Cycle Network and Parking Facilities Plan.

Any proposed Strategic Cycle Network would not be viewed in isolation and would be integrated into other existing and proposed cycle facilities – with particular emphasis on the proposed Green Routes for sustainable transportation to be implemented in the City. (These designs include provisions for cyclists (like advanced stop lines), as well as Quality Bus Corridors, new footpaths and pedestrian crossings.) Cycling would be regarded as an important link in a transport chain by ensuring adequate provision of the facilities to enable integration with other modes, for example, cycle storage lockers or

MEASURE-LEVEL RESULTS	
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secure, sheltered, cycle stands at bus stops along some of the Quality Bus Corridors.

Promotional videos, information leaflets and public exhibitions were used to further publicise and engage the public about sustainable transport improvements in the city.

M6: Actual implementation:

The UCC Cycle Study and other studies carried out into cycling in Cork were reviewed in the context of Miracles to ensure that activities in this area learned from the past. MIRALCES also reinforced the Green Routes Project, which did not explicitly cater for cycle parking facilities.

A survey was carried out to identify where cyclists were parking their bikes in the city in order to decide the best positions for future cycle stands. 36 bicycle stands were purchased for installation in various strategic locations throughout the city such as the plaza beside the Opera House in Emmett Place, near the Tourist Office on the Grand Parade, and outside City Hall.

Awareness measures to promote Sustainable Transport were particularly focused around European Car Free Day.

In January 2004, the second draft of the Cycle Network Plan for Cork was presented and circulated to the local MIRACLES Project consortium and a number of other key City Council employees. This document identified 19 radial routes, 13 link routes and 5 inner city routes for development. Lists of recommended changes were detailed for each route and recommendations for making routes attractive for commuter cyclists and leisure cyclists were clearly distinguished with appropriate colour coding on maps etc. The study was approved by City Council and can be implemented as funding becomes available.

Additional bike stands were ordered in the two most popular designs. As a consequence, by the end of 2004, the bike stands purchased with MIRACLES support provided parking for up to 264 cycles, this represented an increase of over 2000% in the availability of cycle parking in the city centre. By the end of the MIRACLES project 316 cycle spaces will be provided.

Construction work also commenced on two radial “Green routes” from the southeast and southwest entering the city. These included the features recommended in the Cycle Network Strategy to improve cycling, such as advanced stop lines, etc. They also included a range of other features to promote walking and public transport which help promote the MIRACLES measure.

M7: Deviations from the plan:

Additional cycle stands were ordered and by the end of 2004, the cycle stands purchased with MIRACLES support provided parking for up to 264 cycles by October 2005. The number of cycle spaces is expected to reach 316 by the end of the MIRACLES project.

Additional to the original plan a Cycle Safety Training Programme was introduced to all primary schools and the response to this was overwhelmingly positive from those schools that took part. Further rollout of the scheme is being planned.

The Evaluation – how was it done and what are the results?

M8: Method of measurement:

Various tools were used to evaluate the 11 performance indicators for this measure. Survey work took place between February and December 2002 to establish the Baseline Scenario, which included an assessment of cycling facilities in the City Centre, the use of cycle facilities and user and operator surveys. Further information was gathered from data sources such as annual air pollution reports and annual classified traffic counts. Interviews and focus groups provided information on the acceptance by various user groups and operators. The frequency of measurement and exact source of data is

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detailed both in the Cork Local Annex (Deliverable 4.1) and in the Cork Baseline 2002 Report, which is available on request.

Survey work was repeated in 2004 and 2005 to monitor the Ex-Post situation. Cycle parking, level of use of cycling facilities, user acceptance and operator acceptance surveys were carried out. Further information was gathered from data sources such as annual air pollution reports and annual classified traffic counts. Interviews and focus groups provided information on the acceptance views of various user groups and operators. The frequency of measurement and exact source of data is detailed in the Cork Local Annex (Deliverable 4.1). Further details can be found in the Cork Ex-Ante Report and details of the individual Measures surveys can be found in the additional Measure level reports, which are available on request.

M9: Achievement of quantifiable targets:

264 cycle parking spaces were provided in the City Centre as part of this Measure (an increase of over 2000% in the availability of cycle parking in the city centre) by October 2005; this far exceeded the 40% increase in City Centre cycle parking facilities promised as part of the MIRACLES project. By the end of the MIRACLES project 316 cycle spaces will be provided. The limited number of cycle parking facilities in the city centre had previously not been quantified. The redesign of St. Patrick's Street also encouraged more people to walk, cycle and use public transport. This increased citizen awareness of the need, potential and ability to change to more sustainable transport patterns. The overall rating of the new cycle facilities was "very good", by 61% of cycle user respondents as part of a questionnaire survey.

The target increase in the numbers of cyclists was at least 10%. The actual increase was identified from LUTS classified traffic counts in October 2005, which identified a 47% increase in cycling across the inner cordon. A Cycle Study was also carried out as part of this Measure to examine the provision of safer routes for cyclists and pedestrians accessing the city.

M10: Achievement of evaluation-related milestones:

- The establishment of the 2002 Baseline evaluation took place from May to December 2002. This established a 'before' scenario for the Measure. This information included journey time surveys, modal split, emissions, accident rates as well as user and operator acceptance surveys.
- Annual reports on air pollution, accident rates and traffic volumes were also compiled throughout the course of the project.
- Monitoring of the impacts took place throughout the implementation of the Measure with the carrying out of a user acceptance questionnaire and operator acceptance discussions in December 2004 and the collection of quantitative information such as parking spaces provided and usage of same.
- Finally, the ex-post surveys were carried out in April and September 2005.
- Detailed Gantt charts showing the frequency of measurement of each indicator can be found in the Cork Local Annex (Deliverable 4.1).

M11: Report on the measure results:

This section describes the evaluation of MIRACLES Measure 10.1 'Cycle Measures'. Initially a 40% increase in the number of cycle parking spaces in the city centre was to be provided, however, during the course of the MIRACLES project, 316 cycle spaces will be provided.

The indicators for the evaluation of Measure 10.1 are broken into 5 sections; Economy, Environment, Safety, Acceptance and Transport. Many of these indicators were evaluated using both quantitative and qualitative data collection methods. A full explanation of the indicators and how they were

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quantified for 2002 Baseline Scenario is included in the Cork Baseline Report. Similarly for the Ex-Ante evaluation, a full explanation of the indicators and how they were quantified for the Do-Nothing and MIRACLES (Do-Something) 2006 is contained in the Cork Ex-Ante Report.

WP 10.1 Cycle Measures Evaluation

Indicator (Units) {*Meteor Core Ind}		Baseline 2002	Do Nothing 2006	MIRACLES 2006	Ex-Post 2005
C10.1/ Env1a	Emissions [CO2,CO,PM10,NOX] (ug/m^3) {5-11}	See Measure Template 5.1	See Measure Template 5.1	See Measure Template 5.1	See Measure Template 5.1
C10.1/ Accp1a	Operator acceptance rating (Index) {13-14}	Very Negative	Very Negative	Very Positive	Very Positive
C10.1/ Accp2a	User acceptance rating (Index) {13-14}	Very Negative	Very Negative	Positive	61% Very Positive
C10.1/ Accp3a	Ease of use rating (Index) {13-14}	Very Negative	Very Negative	Positive	57% Much Better
C10.1/ Tran1a	Average modal split (% by mode) {26}	See Measure Template 5.1	See Measure Template 5.1	See Measure Template 5.1	See Measure Template 5.1
C10.1/ Tran2a	Parking spaces provided (Number)	8 spaces	Similar to Baseline	40% increase	316 spaces Jan06
C10.1/ Tran3a	Cycle flows through inner cordon (cycles/day)	391 cycles (12hr count)	Static/reducing	Static/Increasing	576 cycles (12hr count)
C10.1/ Tran3b	Use of cycling facilities (%)	N/A	N/A	75%	~30% on stands, similar number parked elsewhere.
C10.1/ Econ1a	Infrastructure Purchase cost (€) {1-2}	N/A	N/A	€180,000	€238,928
C10.1/ Econ2a	Administrative cost (€) {1-2}	N/A	N/A	€80,000	€68,122
C10.1/ Econ3a	Temporary Number employed (Number)	N/A	N/A	0.3 persons	0.4 persons

*N/A – Not applicable * {Meteor Core Indicator} numbers are proxy indicators as information was not available in the detail required by Meteor.*

Table 1 – Summary of indicators Measure 10.1

Table 1 shows a summary of the results for the Baseline, Do-Nothing and MIRACLES Scenarios as well as the Ex-Post 2005 results at indicator level. As can be seen in Table 1; the Cycle Measure was expected to have many beneficial effects in encouraging sustainable modes of transport. It was also anticipated that the environment would improve due to Measure 10.1 with emissions decreasing (C10.1/Env1a).

Overall the number of cycles parked in the City Centre has increased dramatically since the Baseline survey in 2002, where only 7 parked cycles were recorded. An average of 55 parked cycles per day was recorded in the April 2005 surveys increasing to 105 parked cycles in the city centre in the September 2005 surveys. The usage of the cycle facilities is increasing and it is hoped to be on target with the MIRACLES Scenario (C10.1/Tran3b) prediction by the completion of the project. Over 60% of cycles observed during the September surveys were parked at cycle stands. The target increase in the numbers of cyclists was at least 10%. The actual increase was identified from LUTS classified traffic counts in October 2005 identified a 47% increase in cycling across the inner cordon.

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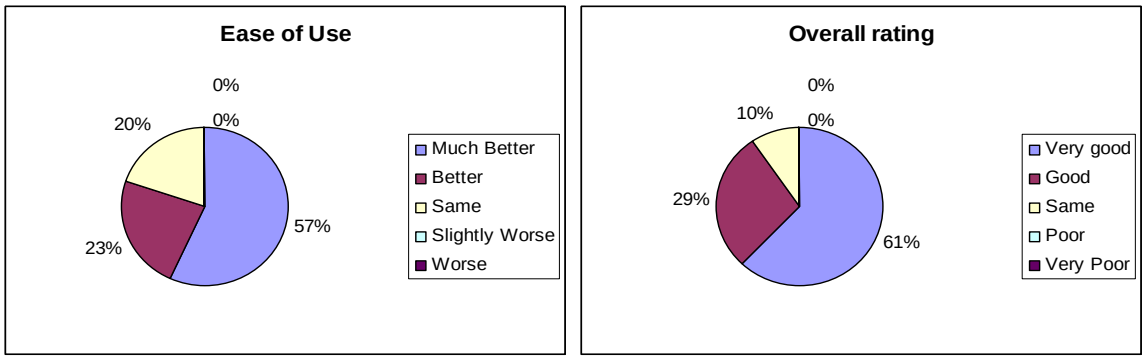

Figure 1a & 1b – Ease of use and Overall rating of cycle stands from user surveys (April 2005)

In the April 2005 surveys, 67%, of user survey respondents stated that the locations of the cycle stands were very convenient or convenient; 61% of respondents stated that cycle parking spaces were easily available in the City Centre, however, 25% of respondents stated that sometimes they had difficulty finding an available space.

Overall, the ease of use rating of the cycle stands was 57% "much better" than pre-MIRACLES, with a further 23% rating it as "better". The overall rating of the cycle stands was 61% "very good". This corresponded with the Ex-Ante predictions on user acceptance (C10.1/Accp2a) and ease of use ratings (C10.1Acp3a). The operator acceptance (C10.1/Acp1a) was Very Positive.

This measure has resulted in a dramatic increase in the number of cycle parking facilities in the city centre. Cyclists seem very happy with the facilities provided as a result of this measure.

The target increase in the numbers of cyclists in the city was at least 10%, the actual increase was identified from LUTS classified traffic counts in October 2005 this identified a 47% increase in cycling across the inner cordon. Without the improvements as part of this measure, cycling rates would possibly have declined

Initially a 40% increase in the number of cycle parking spaces in the city centre was to be provided, however during the course of the MIRACLES project 316 cycle spaces will be provided. This Measure was up-scaled to a larger area within this project with the extension of the "Clean Zone WP5.1", cross financing also took place due to the up-scaling. The measure has also resulted in the requirement for the consideration of cycle parking in planning permission applications. Cork City Council will continue to encourage cycling post-MIRACLES with an emphasis on the provision of a cycle network.

Lessons Learned – what do other cities, other actors and the EC have to consider?

M12: Barriers and drivers of the measure implementation / Process evaluation

The drivers for this Measure have existed since the 1976 Land Use and Transportation Study for Cork, which promoted sustainable transport through the use of cycle routes. In November 2000, UCC completed a report for the City Council on "The Potential Role of Cycling in Cork City" which was used to inform the original design of this task. Then in 2001 the Cork Area Strategic Plan was produced which developed the concept of Green Routes, incorporating the improvements to promote walking, cycling and public transport desired for CIVITAS.

The Cycle Network Plan for Cork was finalised, which identified 19 radial routes, 13 link routes and 5 inner city routes for development. Lists of recommended changes were detailed for each route and recommendations for making routes attractive for commuter cyclists and leisure cyclists were clearly distinguished with appropriate colour coding on maps, etc. This study was approved by Cork City

MEASURE-LEVEL RESULTS	
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Council and thus can be implemented as funding becomes available.

M13: Interrelationships with other measures

The access restrictions on Patrick Street WP5.1 are complimented by better facilities for pedestrians and cyclists. Similarly the new Park and Ride facilities WP7.3 provides dedicated parking spaces for cyclists.

The Green Routes Project (a parallel project, part of the Do-Something Scenario) should substantially increase the cycling facilities in the city centre in terms of cycle lanes. It is hoped that the combination of this project with the MIRACLES project will further help to increase the number of cyclists.

M14: Lessons learned

This MIRACLES measure ensured that cyclists were provided with a more integrated infrastructure by the implementation of green routes and provision of information on new cycle markings, etc. The success of this Measure resulted in Cork City Council implementing a cycling promotion campaign in 2005. MIRACLES part funded a publicity campaign with cartoon characters promoting cycling and walking and the new infrastructure to facilitate them.

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5. Measure 10.2

MEASURE-LEVEL RESULTS	
Measure title: Mobility Management Measures	**Project: MIRACLES**
Measure number: 10.2 Mobility Management Measures	**City: Cork**

The Measure – what is it about?

M1: Measure objectives:

The objectives of Measure 10.2 were to:

- Promote greater awareness of the need and potential for more sustainable transport commuting habits
- Demonstrate methods for reducing peak-hour traffic congestion, such as carpooling.
- Reduce the number of vehicle trips (and their associated emissions) incurred by employees of Cork City Council. It was hoped that a 5% decrease in the use of the private car amongst employees of Cork City Council would result.

M2: Measure description:

A car-pool register was set up, in which employees of Cork City Council provided information about their regular origin and destination patterns, along with some minimal contact details. They would then be introduced to other willing car-poolers with similar journey patterns.

The Implementation – how was the measure implemented?

M3: Innovative aspects:

Like most other Irish local authorities, Cork City Council had not previously addressed the sustainability of its own staff commuting habits in any formal/organised fashion. The car pool register (which later became the Travel to Work survey) made use of the e-mail system both for promotion and implementation. This greatly simplified communication and allowed for a degree of confidentiality for participants, who could initially register a personal e-mail address without giving a phone number. Cork City Council was unaware of any other local authority in the country operating such a wide-ranging, organised system for promoting car pooling.

Car pooling on this scale would be regarded locally as a very radical initiative as it is not at all popular. Most peak hour traffic is composed of individuals travelling alone to work and parents dropping off their children to school. The only other city centre organisation operating a car sharing promotion was University College Cork who initiated it before the end of 2001. However, this petered out rapidly due to poor uptake. Car pooling initiatives being developed elsewhere were more high-tech, whereas to begin with Cork City Council used low-tech matching techniques as appropriate given the number of respondents.

M4: Situation before CIVITAS:

There were approximately 1,500 people working for Cork City Council. Approximately 500 of these were contactable by phone or e-mail. All temporary employees in receipt of weekly pay slips received regular staff bulletins every few weeks. All salaried employees were generally contactable by either mobile phone or e-mail. This made it possible to promote a car pool register amongst a wide audience using existing communication channels. Pre-MIRACLES, there were however, no accurate records of how Cork City Council employees commuted to work. There was also no structured framework for organising car pools, although some carpooling occurred on an informal basis.

M5: Design of the measure:

Initially, sustainable transport promotional information and car pooling registration forms for Council Staff would be designed. The next step would be to register sufficient numbers of employee's origin and destination travel patterns to initiate collation (at least two travel patterns must match). All employees with similar postulated journey routes would be contacted to inform them about the numbers of others with whom they might be able to car-share. They would be asked for permission to disclose contact information to the others in their area with a view to arranging car-sharing amongst themselves. Feedback would be solicited from active car poolers and the system would be re-launched/ upgraded on a regular basis.

M6: Actual implementation:

Staff Mobility Management Scheme Design: During the MIRACLES inception phase, research was carried out into other car pooling schemes. In February 2002, work commenced on the design of car-pooling information and Travel to Work Survey forms. The first draft questionnaire was based on a similar Travel to Work Survey produced by the Irish Energy Centre as part of the "Way to Go" project. The "Way to Go" questionnaire was adapted to make it more locally relevant and modified according to the MIRACLES/CIVITAS dissemination guidelines. Following the recommendations of the "Way to Go" Project, posters were also designed highlighting the negative impacts of private car use and the benefits of car-pooling. Three different designs were produced and the posters were posted on notice boards in the City Centre Council offices.

Travel to Work Survey: The questionnaires were first distributed by hand in the Council's city centre offices and then uploaded to the City Council's INTRANET site. More publicity of the car-pooling Initiative was also achieved through extensive use of posters, advertising in staff bulletins, etc. In August, 1,500 updated questionnaires were printed and included in all pay packets distributed to City Council employees.

In January 2003, the questionnaires were slightly modified to cater for both follow up and new registration applications. It had been found that many of the previous respondents had skipped over the section requesting contact details, so this was made the first question on the form and questions about origin and destination patterns were clarified by providing more clearly labelled spaces for responses. It was also decided to carry out as many surveys as possible face to face, since this provided the best response rate and provided more opportunities for the productive exchange of ideas about sustainable commuting.

The experience gained through the Mobility Management Measure was used in the Schools Mobility Management Initiatives. A Travel To School survey was designed as part of the Schools Project to assess the baseline situation, to identify the potential for change and to prompt discussion about transport in schools. To optimise the response rate, the survey was confined to two simple questions: one to ascertain how the students travelled to school, and one to gauge how many travelled over 2km to school. In January 2004 this survey was sent to all primary (61) and secondary (26) schools in Cork City. Ultimately it was decided to establish two pilot walking schemes: one on the north side and one on the south side of the city.

M7: Deviations from the plan:

The experience gained in the Mobility Management Measure was also used in Mobility Management Initiatives in local schools. In January 2004 the first Travel To School Survey was carried out and throughout 2004 a programme of cycle safety training was initiated in schools.

The Evaluation – how was it done and what are the results?

M8: Method of measurement:

Various tools were used to evaluate the 12 performance indicators for this measure. Survey work took place between March and December 2002 to establish the Baseline Scenario, which included an in-depth assessment of the modes of transport of Cork City Council employees. Further information was gathered during this assessment e.g. journey times, willingness to use car pooling, opinions on sustainable modes of travel. Interviews were carried out with the operator to provide information on the acceptance views of the operators. The frequency of measurement and exact source of data is detailed both in the Cork Local Annex (Deliverable 4.1) and in the Cork Baseline 2002 Report, which is available on request.

User acceptance and operator acceptance surveys and continuous monitoring of the car pooling scheme were carried out from May 2003 to quantify the Ex-Post situation. The frequency of measurement and exact source of data is detailed in the Cork Local Annex (Deliverable 4.1). Further details can be found in the Cork Ex-Ante Report which is available on request.

M9: Achievement of quantifiable targets:

A 5 % decrease in the use of the private car amongst employees of Cork City Council was expected as a result of the MIRACLES project. This decrease was achieved largely due to the increasing

access restrictions in the city and the reduction in parking spaces available to City Council employees (approximately a 20% reduction in parking spaces over 3 years).

In the Baseline 2002 surveys, 70% of employees used private cars as a means of transport (42% travelled alone) with the remaining 30% using sustainable modes (public transport, cycling, walking, train). In the 2003 surveys, 64% used private cars (33% travelled alone) and 42% used sustainable modes. In the 2004 surveys, 61% used private cars (34% travelled alone) and 36% used sustainable modes, an increase on the baseline figures for walking. The number of people travelling in private car with occupancy of one decreased from 42% in 2002, to 33% in 2003 but increased slightly to 35% in 2004.

M10: Achievement of evaluation-related milestones:

- The establishment of the 2002 Baseline evaluation took place from May to December 2002. This established a 'before' scenario for the Measure. This information included journey time surveys, modal split, as well as user and operator acceptance surveys.
- Monitoring of the impacts was by user acceptance questionnaires which were carried out repeatedly from May 2003.
- Operator acceptance discussions were carried out in December 2004 and the collection of quantitative information such as economic costs and a review of all surveys were carried out.
- Detailed Gantt charts showing the frequency of measurement of each indicator can be found in the Cork Local Annex (Deliverable 4.1).

M11: Report on the measure results:

The indicators for the evaluation of Measure 10.2 are broken into 5 sections; Economy, Environment, Safety, Acceptance and Transport. Many of these indicators are evaluated using both quantitative and qualitative data collection methods. A full explanation of the indicators and how they were quantified for the 2002 Baseline Scenario is in the Cork Baseline Report. Similarly, for the Ex-Ante evaluation, a full explanation of the indicators and how they were quantified for the Do-Nothing and MIRACLES (Do-Something) 2006 is contained in the Cork Ex-Ante Report which is available on request.

Table 1 shows a summary of the results for the Baseline, Do-Nothing and MIRACLES Scenarios as well as the Ex-Post 2005 results at indicator level. As can be seen from Table 1, the Mobility Management Measure was expected to have many beneficial effects in encouraging of sustainable transport by decreasing the use of the private car amongst Cork City Council employees by 5%. It was also anticipated that the environment would improve due to Measure 10.2 with emissions decreasing (C10.2/Env1a).

WP 10.2 Mobility Management Measures Evaluation					
Indicator (Units) {*Meteor Core Ind}		Baseline 2002	Do Nothing 2006	MIRACLES 2006	Ex-Post 2005
C10.2/ Env1a	Emissions [CO2,CO,PM10,NOX] (ug/m^3) {5-11}	N/A	N/A	5% decrease in private car usage	>5% reduction in private car use
C10.2/ Saf1a	Security safety rating (Index) {17}	N/A	N/A	Positive	Neutral
C10.2/ Accp1a	Operator acceptance rating (Index) {13-14}	N/A	N/A	Neutral	Neutral
C10.2/ Accp2a	User acceptance rating (Index) {13-14}	N/A	Negative	Positive	Very Negative
C10.2/ Accp3a	Ease of use rating (Index) {13-14}	N/A	Negative	Neutral	Neutral
C10.2/ Accp4a	Comfort rating (Index) {13-14}	N/A	Negative	Neutral	Neutral

C10.2 Tran1a	Journey time (Minutes)	Average 31 minutes.	Increase to Baseline	Slight decrease to Do-Nothing	Average 29.5 minutes.
C10.2 /Tran2a	Average modal split (% by mode) {26}	71% Car, 1% train 4% cycle, 14% bus, 9% walk, 1% motorcycle	Similar to Baseline	5% decrease in private car usage	See Table 2 5% decrease in single occupancy car usage
C10.2/ Tran3a	Information accessibility (Index)	Very Negative	Very Negative	Positive	Neutral
C10.2/ Econ1a	Infrastructure Purchase cost (€) {1-2}	N/A	N/A	€4,000	€0
C10.2/ Econ2a	Administrative cost (€/yr) {1-2}	N/A	N/A	€2,500	€37,690
C10.2/ Econ3a	Temporary Number employed (Number)	N/A	N/A	One fifth of an existing person	1 person

*N/A – Not applicable * {Meteor Core Indicator} numbers are proxy indicators as information was not available in the detail required by Meteor.*

Table 1 Summary of Evaluation Cork MIRACLES Measure WP10.2

Travels to Work surveys were conducted annually throughout the course of the MIRACLES project. Table 2 shows the modal split (C10.1/Tran2a) of Cork City Council Employee's for 2002, 2003 and 2004.

Travel to Work Survey						
Year	**% by car occupancy 1**	**% by car occupancy >1**	**% bus**	**% cycle**	**% walk**	**% train**
2002	41.7	28.5	11.6	3.9	13.4	0.9
2003	32.7	31.6	10.0	2.0	23.1	0.6
2004	34.8	28.1	9.9	2.6	23.9	1.1

Table 2 Travel to Work survey Cork City Council Employees.

The 2003 survey was completed by 199 individuals, 32% of whom were travelling in a car with occupancy greater than 1. Both surveys produced a lot of interesting information about the modal split of City Council commuters. For the first analysis, separate sheets and charts were set-up to compare journey distances, travel modes, travel speeds and mode-choice motivation. A lot of useful suggestions and information about sustainable commuting in the city was gleaned from this process- which helped to inform other measures. Also, it was felt after the first survey that the widespread information dissemination had succeeded in raising awareness about the impacts of travelling to work, encouraging more people to choose more sustainable modes, whenever possible. Indeed, the results from the 2003 survey indicated that, for whatever collection of reasons, there had been a modal shift towards more sustainable transport.

The 2004 surveys illustrated how these trends had been maintained, as is illustrated in the Table 2 comparing results from 2002 and 2003. The number of responses from employees relating to possible participation in a car pooling scheme run by the City Council was poor and it was found those that were using car pooling at the time of the survey preferred car pooling privately with friends and/or relatives rather than the current workplace initiated schemes. Something that the surveys did highlight however was the idea of setting up of a car pooling forum on the internet or intranet.

It is felt that car-pooling alone cannot achieve a substantial shift in modal split and the combination of the promotion of sustainable modes along with the necessary restrictions (e.g. reduction in parking, increase in cost) achieve a more prominent change towards sustainable modes of travel.

In the Baseline 2002 surveys, 70% of employees used private cars as a means of transport (42% travelled alone) with the remaining 31% using sustainable modes (public transport, cycling, walking, train). In the 2003 surveys, 64% used private cars (33% travelled alone) and 42% used sustainable

modes. In the 2004 surveys, 61% used private cars (34% travelled alone) and 36% used sustainable modes, an increase on the baseline figures for walking. The number of people travelling in private cars with occupancy of one has decreased from 42% in 2002, to 33% in 2003 and 35% in 2004.

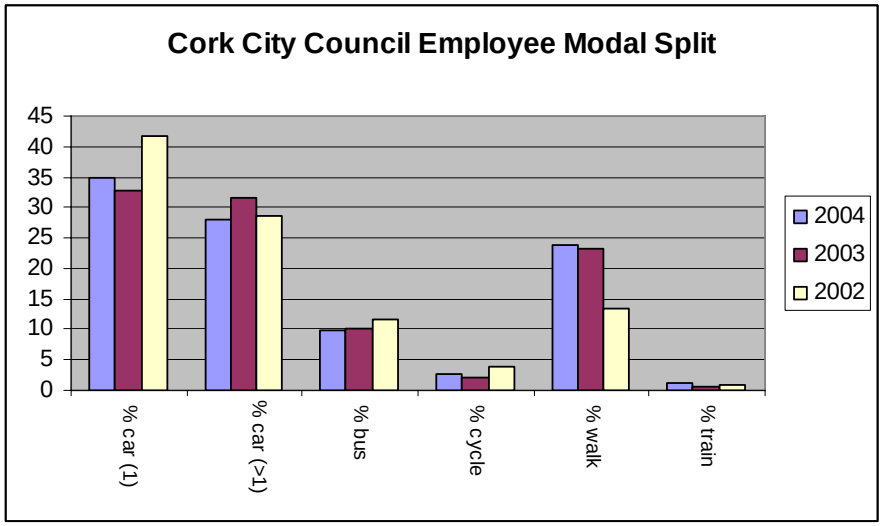

Figure 1 – Cork City Council Employee – Travel to Work Modal Split.

The surveys carried out in 2003 and 2004 showed an increase in the numbers of employees walking to work, and using the train. In 2002, 63.06% of drivers stated that they drove because it was the fastest mode. The proportion of drivers with this opinion fell to 9.86% in 2003 and to 7.51% in 2004. The group that is happiest with their speed of travel is the cyclists, with speed and health reasons being cited as motivators by around 50% of cyclists in 2003 and 2004.

The ease of use (C10.2/Accp3a) was rated as 'Neutral' as no one availed of official car pooling. User acceptance (C10.2/Accp2a) was 'Very Negative' as people were concerned about insurance issues, or issues related to restrictions on the use of vehicles for work, other people were worried that they couldn't be relied upon because their journey patterns varied with school drop offs or site visits or different activities after work, etc. Those who were independently involved in car pooling were all very happy with it.

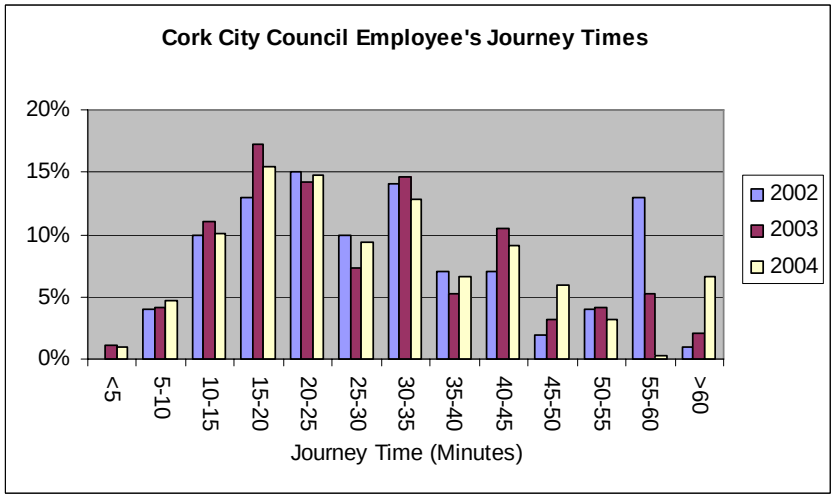

Figure 2 – Cork City Council Employee – Travel to work journey times.

The mean journey times for Cork City Council Employees have decreased slightly since the beginning of the project; 31.4 minutes in 2002, 29.2 minutes in 2003 and 29.5 minutes in 2004. This is due to staff living closer to the city centre (15 – 20 minute journey times have increased from 13% to 17% in

2003 and the >55 minute journey time; 14% in 2002, 6.9% in 2004) which counteracts the increase in journey times expected due to increasing congestion.

The majority of the costs were due to the Travel to Schools programme which was cross financed with Measure 5.1 and Measure 10.1.

MIRACLES WP10.1 has influenced policy on planning permission by the requirement that all large developments have to consider mobility management. The official City Council car pooling scheme was not found to be as effective as other mobility management measures such as parking restrictions.

Lessons Learned – what do other cities, other actors and the EC have to consider?

M12: Barriers and drivers of the measure implementation / Process evaluation

The main driver was the desire to encourage more staff to switch to more sustainable commuting habits, which in turn should help to reduce congestion, reduce pollution, reduce staff travel expenditure, promote social interaction between staff and set a good example of more sustainable travelling to the rest of the city. This would be in support of and supported by the objectives of the City Development Plan, the City Council's "Corporate Plans" and the Council's Energy Policy and Strategy.

Barriers included people's desire for independence, variable work, social and home commitments, concerns about passengers suing in case of accident, etc. Concerns that staff with driving allowances could not walk or cycle to nearby sites or park at home if living close to the office were raised with management.

M13: Interrelationships with other measures

The promotional activities associated with the Travel to Work surveys were used as an opportunity to promote other aspects of CIVITAS such as the Park and Ride (WP7.3), the cycle-ways improvements (WP10 .1) and the use of more environmentally friendly fuelled vehicles (WP 12.2). There was a particular focus on car pooling during the awareness raising activities associated with European Car Free Day (WP 10.1).

M14: Lessons learned

To increase the return rate of the Travel to Work survey, most surveys were conducted face-to face; mail drops proved costly and inefficient.

Other cities wishing to promote sustainable mobility management should place a heavy emphasis on promoting sustainable mobility before and during the establishment of formal schemes to support sustainable commuting.

It was found that car-pooling alone did not achieve a shift in modal split and the combination of the promotion of sustainable modes along with parking restrictions (e.g. reduction in parking, increase in cost) achieved a greater change towards sustainable modes of travel. The parking restrictions for Cork City Council employees reinforced the need to consider alternatives to individual car use.

Contact Point

💻.www.corkcity.ie/services/depts/dept_road_miracles.html

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6. Measure 11.2

MEASURE-LEVEL RESULTS	
Measure title: Improved Network Management	**Project: MIRACLES**
Measure number: 11.2 Park by Mobile Phone	**City: Cork**

The Measure – what is it about?

M1: Measure objectives:

The objectives of this measure were to:

- Reduce the inner city traffic congestion caused by motorists driving around searching for a parking space.
- Implement a parking system capable of discriminating in favour of more environmentally friendly vehicles.
- Launch a system for registering to use the pay by phone system in addition to initiatives to enable online or phone-based payment of parking fines and residence parking permits.
- Utilize the new procedures to enforce greater compliance with parking by-laws, better turnover of spaces and incentives to reduce traffic congestion.

M2: Measure description:

With the aid of CIVITAS funding, an innovative parking management/parking payment scheme which could be accessed by mobile phone technology was introduced.

Subscribers were then able to pay for on-street parking using their phones and access system information. The system administrator is able to send a selection of messages to the subscribers. For example, users can be reminded when their parking time is nearly up. The use of SMS would be a key feature of the Mobile Phone Parking payment concept whereby mobile phones could be utilised as pre-trip and post-trip devices. However, except in the case of future possible applications for public transport users, the mobile phone would not be promoted as an on-trip information device.

Once registered, motorists pay parking fees by:

- Parking in an available space and then dialling the dedicated Park by Phone number displayed on the nearest on street parking information sign;
- The system recognises the motorist using the caller ID;
- The motorist then inputs the parking zone code for the area (as displayed on street signage). This identifies the location and the system deduces the tariff and parking time allowed.
- Park by Phone checks the motorist's registration details and provides details of the relevant parking charges.
- Finally, when prompted, the motorist simply presses a button to confirm payment.

After authentication, the system confirms payment; a receipt text message (SMS) is automatically sent to the motorist, confirming all the booking and payment details. Parking time may also be increased using the phone (provided that the local parking by-laws are adhered to). Optional services also allow users to be reminded when there is 10 minutes remaining on the active parking payment.

Several auxiliary features were considered at the planning stage. In keeping with CIVITAS aims, it was intended that phone-based parking payment would help to integrate a range of sustainable transport measures and objectives. For example, it could be possible for members of the public to phone and check the availability of parking spaces in the multi-storey car parks before they embark on their journeys. With the planned implementation of a web-based software utility this information could be made available on the Internet and to subscribers of the proposed parking service. These features have not yet been implemented in the system due to the delays experienced.

MEASURE-LEVEL RESULTS

Measure title: Improved Network Management	**Project: MIRACLES**
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Subscribers might also be able to pay for Park and Ride parking using their phone (currently not operational due to delays) and the City Council might have the option of sending subscriber messages about sustainable transport options and initiatives like Car Free Day etc. An on-line or phone-based payment of parking fines and residence parking permits was also implemented. The subscriber database could be used to identify more environmentally friendly vehicles (such as those involved in Task 12.2) and then discriminate favourably towards these vehicles. Although the system is currently capable of discriminating favourably towards these vehicle this facility has not yet been implemented.

The Implementation – how was the measure implemented?

M3: Innovative aspects:

The unique feature of the mobile parking system was the implementation of a subscriber database incorporating a matrix of group types and conditions which would determine the level of access and possible discounts that would apply on each transaction or event. The inclusion of the mobile parking database (maintained by the local authorities) should facilitate an integrative approach to encourage a modal shift in the future.

The use of SMS was a key feature of the mobile parking concept whereby mobile phones could be utilised as pre-trip and post-trip devices. Users could also receive messages encouraging them to use more sustainable modes of transport such as the bicycle or the bus.

M4: Situation before CIVITAS:

Cork City Council operates a parking disk system for on-street parking in the city centre and suburbs which requires a considerable effort to enforce. There is also a lack of turnover of spaces, which has an impact on the level of access. There are eight off-street public car parks in the city at present, two of which are operated on behalf of Cork City Council. Parking guidance signs are in operation at decision points on the approaches informing motorists as to the availability of spaces. However, motorists are unable to access the availability of parking before they start their journeys.

M5: Design of the measure:

The specification for the system sought a parking payment by phone system with three key features:

- A cashless parking payment system for motorists;
- An enforcement system for traffic wardens; and
- A complete administration and reporting system for the local authority.

Potential suppliers were also required to design a marketing strategy to promote the scheme via advertisements on radio, websites and via handouts/information leaflets to on street-parkers, petrol stations, libraries, etc.

M6: Actual implementation:

In May 2002 pre-qualification notices to tender were published on the Irish government's 'e-tenders site' and in the EU Official Journal. Three compliant tenders were submitted by the 12th January 2003. Approval by the City Manager was obtained on the 19th March 2003 and the project then proceeded to contract stage with a preferred tender.

In spring 2003, all traffic wardens and their supervisors were fully briefed and received a demonstration of the project, which included some equipment prototypes. However, because legal matters prolonged the contract negotiation process, the introduction of the warden hand held devices (required to monitor compliance) was deferred until November 2003. As soon as these were resolved, the contract was signed in December 2003. However further delays ensued, this time relating to negotiations with the traffic wardens about terms and conditions of employment in relation to the new working procedures. Although the negotiations with traffic wardens were resolved in January 2004, there were also delays in obtaining the handheld units and in the final system description for the configuration of information technology systems to process the signal output.

MEASURE-LEVEL RESULTS	
Measure title: Improved Network Management	**Project: MIRACLES**
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The final system design was completed in early 2004 and the customised warden handhelds were delivered to the contractors. The administration software for processing information from the warden handhelds was installed on the 5th of August. Changing the local parking by-laws was also required. After that, the wardens training in the use of the handheld devices commenced and was completed by the end of the autumn. The processing of all parking fines was considerably enhanced with the new system, with parking fines entered on the system automatically and payment options available online.

In February 2005 people were invited to register for the new method of parking payment. Park by Phone Website application forms were available from the website (www.parkbyphone.ie) and brochures, promoting the system were produced bearing the MIRACLES logo. The scheme was also advertised on the City Council's website and with all parking fines notices issued by the Council. Signs designating "Park by Phone" zones were erected throughout the city centre from January to March 2005. Applicants were issued with starter packs and a barcode sticker, to be attached to the vehicle windscreen. They were then asked to register on a database, providing full details of their car and preferred payment method – i.e. credit card or bank account.

To incentivise early subscription and use of the system, subscribers were offered a month's free on-street parking. Following this, users were allowed to stay for two hours in a one hour zone at the standard rate of €1.50 an hour plus the call cost. They can also stay for an extra hour in a two hour zone where parking is normally €1.80 for two hours (€1.50 plus call cost for Park by Phone users). Call costs typically range from 11 to 31 cent per hour, so parking by phone should cost no more than disc-parking. Parking time reminders are paid for by the user at 10 cent per text reminder

To monitor compliance with the parking laws the traffic wardens use the handheld devices which interact with the Park by Phone system as follows:

- The traffic warden scans the bar code label or RFID tag on each car to authenticate the parking validity in real time.
- The handheld sends a wireless command querying the database in real-time and determines whether the car is parked legally.
- Details on the car such as make, model and registration number, are also retrieved.
- Illegally parked cars are automatically issued with a printed ticket, which is affixed to the car.
- Other non-parking offences – such as parking on double yellow lines or in disabled parking spaces, can be manually entered before printing.
- Finally, for cars that have not registered with Park by Phone, the traffic warden must visually verify their parking status. The warden can then manually enter the registration number of the car and print off parking tickets, if appropriate.

New printers, with a higher water resistance, (to cope with the Irish weather) had to be specially ordered for the handheld units and a belt was designed for the wardens, with holders to store the devices when not in use.

For the local authority, payment and administration of the system is as outlined below:

- Parking payment is deducted from the users' bank account or credit/debit card, depending on the payment option chosen when registering. The cost of the phone call is borne by the motorist at the same tariff as a normal mobile-to-mobile call. (In other words, Park by Phone does not add any additional charges to the cost of the call).
- Parking tickets registered in the handheld computer are logged in the system database in real time, so that processing can commence immediately.
- The system will also be capable of generating reports on: warden productivity, periodic analysis of parking patterns and demographic analysis of parking traffic origin.

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- The benefits to the local authority are: the speed of implementation, reduction in ticket processing errors, reduction in cash collection costs and conservation of paper.

M7: Deviations from the plan:

Unfortunately there were some delays with the implementation of the system. It was originally planned to fully implement the system by July 2003, but this was delayed to August 2005 for the following reasons:

- Initially the first phase of the implementation had to be brought forward because of delays in ensuring adequate match funding. (2003)
- Legal matters prolonged the contract negotiation process (December 2003).
- Negotiations with the traffic wardens about the impact of the new working procedures on their terms and conditions of employment, awaiting the customised handheld units, problems printing tickets in inclement weather conditions. (Early 2005)
- New parking by-laws had to be approved by the Council (June 2005).
- Development of a system for safe relay of customer information (August 2005).

Other deviations from the plan were:

- The Park by Phone parking fee is cheaper than the cost of a parking disc to compensate for the cost of the phone call.
- Initially offering subscribers free parking for a month and then extended parking times in the city centre zones, to incentivise use of the system.

The delay in implementation has caused further delays in the expansion of the system to integrate with other systems (e.g. multi-story car parks, pay & display, Park and Ride). These will not be introduced during the lifetime of MIRACLES.

The Evaluation – how was it done and what are the results?

M8: Method of measurement:

Nine Performance Indicators were used to evaluate this measure. The Baseline for this work package was not applicable as no such parking scheme existed in Cork.

Survey work was conducted in December 2005 to monitor the Ex-Post situation. Patronage records, parking occurrences and user acceptance and operator acceptance surveys were carried out. Records provided by Cork City Council provided information on financial matters. Interviews and questionnaire surveys provided information on the acceptance views of users and operators. The frequency of measurements and data sources are detailed in the Cork Local Annex (Deliverable 4.1).

M9: Achievement of quantifiable targets:

No quantifiable targets were set for this measure.

M10: Achievement of evaluation-related milestones:

The 2002 Baseline was not applicable as no such scheme existed in Cork. Monitoring of the ex-post impacts of the Measure included a user acceptance questionnaire in December 2005 and the collection of quantitative information such as patronage figures and the number of parking occurrences. Detailed Gantt charts showing the frequency of measurement of each indicator can be found in the Cork Local Annex (Deliverable 4.1).

M11: Report on the measure results:

The initial opening of Park by Phone commenced in August 2005, with full implementation in October 2005 with 60 streets available for parking by this method. Following a review in January 2006, the Park by Phone area will triple in size by the end of Spring 2006.

The performance indicators for the evaluation of Measure 11.2 are broken into 5 sections; Economy, Environment, Safety, Acceptance and Transport. Many of these indicators were evaluated using both

MEASURE-LEVEL RESULTS

Measure title: Improved Network Management	Project: MIRACLES
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quantitative and qualitative data collection methods. A full explanation of the indicators for the 2002 Baseline Scenario is available in the Cork Baseline Report. Similarly for the Ex-Ante evaluation, a full explanation of the indicators and how they were quantified for the Do-Nothing and MIRACLES (Do-Something) 2006 is contained in the Cork Ex-Ante Report which is available on request.

Park by Phone commenced operation on the 10th of August 2005, with parking charges of €1.50 waived until the end of September. The call cost (20c – 30c) brings the cost in line with disc parking (€1.80). Parking time reminders are currently paid for by the user (at 10 cent per text reminder).

In the first two weeks after the system went live, 300 cars were registered. By November 2005, there were 500 people registered and another 1,000 had received registration packs. Although less than 35% of those who received registration packs have registered, it is hoped that the numbers of users will rise in response to the multi-media marketing campaign developed by the Park by Phone consortium. This includes press-releases to all the newspapers and newsletters in local circulation, advertisements on local radio and dissemination of the Park by Phone information leaflets to all city centre post boxes and newsagents.

WP 11.2 Parking Management Ex Ante Evaluation					
Indicator (Units) {*Meteor Core Ind}		Baseline 2002	Do Nothing 2006	MIRACLES 2006	Ex-Post 2005
C11.2/ Accp1a	Operator acceptance rating (Index) {13-14}	N/A	N/A	Very Positive	Positive
C11.2/ Accp2a	User acceptance rating (Index) {13-14}	N/A	N/A	Very Positive	Very Positive
C11.2/ Accp3a	Ease of use rating (Index) {13-14}	N/A	N/A	Positive	Very Positive
C11.2/ Tran1a	Information accessibility (Index) {13-14}	N/A	N/A	Very Positive	Very Positive/Positive
C11.2/ Tran2a	Number of instances of Park by Phone (Number)	N/A	N/A	50,000 in 2004 * 400,000 in 2005 600,000 in 2006	1,256 Sept 05 1,231 Oct 05 1,634 Feb 06
C11.2/ Econ1a	Infrastructure Purchase cost (€){1-2}	N/A	N/A	€ 260,000	€250,000
C11.2/ Econ2a	Operating cost (€/yr) {1-2}	N/A	N/A	€ 60,000+	€60,606
C11.2/ Econ3a	Subsidy (€/yr) {1-2}	N/A	N/A	€ 0	€0
C11.2/ Econ4a	Temporary Number employed (Number)	N/A	N/A	1/5 existing person plus 2 to 3 additional posts in Park By Phone	1/5 existing person plus 2 to 3 additional posts in Park By Phone

N/A – Not applicable, TBC – To be completed. Meteor Core Indicator numbers are included in the Cork Local Annex.

Table 1 - Summary of indicator results for Measure 11.2

30% of those registered use the Park by Phone service "frequently" (regularly i.e. once a week or more) with another 30% using the service "occasionally" (e.g. over two weeks between use). 30% of However, 35% of those registered had never used the service in the first three months of operation.

1,256 parking instances using Park by Phone occurred in September 2005 and 1,231 occurred in October 2005 when the system was fully implemented. The number increased to 1,634 by February 2006 (approximately 100 Park by Phone parking instances per day). The number of instance is

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steadily increasing and Cork City Council are confident that by the end of 2006 the market share of Park by Phone (which stands at 1.5% at present) will have increased significantly to between 5% and 7%.

The cost per transaction to the City Council per parking instance is lower for Park by Phone than for Parking Discs (printing costs, distribution costs, commission paid per disc sold to retail outlets).

60 streets located in the central business district are currently in operation with Park by Phone. 32% requested a 'large expansion', a further 32% a 'slight expansion', 6% thought it was 'satisfactory', with 17% rating is as 'fairly adequate' and 13% rating it as 'very adequate'. A review of the area covered was conducted in January 2006 and the area will triple in Spring 2006.

Park by Phone was rated by 69% of users to be 'very easy' to use with a further 10% rating it as 'fairly easy'. Comments received suggested that people were a little apprehensive the first time they tried it but then found it straightforward. The main reason for use by respondents was; faster/easier than disc parking 79%, ability to top-up remotely 18%.

42% rated the ease of finding out about Park by Phone as 'very good', an additional 39% rated it as 'fairly good' with 8% rating it as 'satisfactory' and 10% as 'poor'.

The overall rating of Park by Phone was rated at 'very good' by 59% of respondents, an additional 4% rated it as 'fairly good' with 14% rating it as 'satisfactory' and 3% as 'poor'. No respondents rated the overall rating as 'very poor'. 99% of respondents said they would use Park by Phone again.

Regarding costs, the City Council pays for the warden handhelds, back office support systems software, hardware and licensing (for issuing fines, etc) and approximately 50% of the system promotion costs. The CIVITAS funding helped to fund the initial project design and tendering process and some of the project promotion initiatives. The registration of users and maintenance of system costs are largely borne by the system operator (the Park by Phone Consortium). However, the cost of additional services such as text messaging subscribers about Park and Ride services or reminding users that parking time is up, will be paid for by either the Council or user.

Cork City Council will continue to promote and expand this scheme post-MIRACLES.

Lessons Learned – what do other cities, other actors and the EC have to consider?

M12: Barriers and drivers of the measure implementation / Process evaluation

Prior to MIRACLES, Cork City Council was interested in finding an alternative to disc parking that would address some of the negative feedback from the general public. One complaint was that people often found it difficult to find shops selling discs, particularly on Saturdays. The traditional alternative of pay and display meters would have required a high capitol investment and on its own would have eliminated some of the advantages of disc-parking. This Measure aided in retaining the viability of the city centre.

On the other hand, a phone-based parking payment system would be less expensive for the council to implement since it could be established as a PPP (Public Private Partnership) and the private partner should cover most of the infrastructure set-up costs. A phone-based parking payment system could also remind people when their parking time is almost up and also provide the possibility of remotely extend their parking time by an hour when unexpectedly detained elsewhere. Neither of these options would be possible with any other system and it was considered that these features would greatly enhance customer satisfaction with parking. Furthermore, because the system could be operated in parallel with the existing disc-parking system, customers would be able to select the system best adapted to their needs.

MEASURE-LEVEL RESULTS	
Measure title: Improved Network Management	**Project: MIRACLES**
Measure number: 11.2 Park by Mobile Phone	**City: Cork**

There was a risk that adequate matching funding might not be secured for the Park by Phone parking scheme. To overcome this, representation was made to the director of services and city engineer, highlighting the benefits of parking payment by phone to the local authority in terms of the improved efficiencies and reduced overheads that can be achieved etc. This was successful in attracting internal financial commitment to the project. There is still a risk that when fully implemented, the system might be under-utilised or not deemed financially viable. However, these risks have been diminished by ensuring that the successful tenderer makes adequate provision for marketing campaigns and also that user charges are sufficient to fund the pricing structures.

The traffic wardens were concerned about the impact of the new working procedures on their terms and conditions of employment. The local parking by-laws also had to be changed and approved by Council, but this proved to be more a minor hurdle than a barrier. Another obstacle to the system implementation was the difficulty trying to secure a virtual private network for the Park by Phone database. There were delays in: agreeing the final system design, sourcing tickets and awaiting the arrival of the customised handhelds. The Park by Phone parking system also took longer than expected to set up, but all these delays were resolved by the end of 2005.The only barrier which has not thus far been overcome concerns the integration of the Pay-by-Phone database with the Park and Ride exit control management software and that of multi storey parking spaces.

The handheld computers has resulted in many significant improvements; it allowed the launch of web and automated phone based payment systems for parking tickets, as well as the instant upload of parking fine notification to system (previously taking up to 4 weeks for a ticket to be entered onto the computer system manually). 30% pf all parking fines are now paid through one of the two automated systems.

M13: Interrelationships with other measures

The Pay by Phone parking system can be used to promote WP5.1, WP7.3 and WP10.1. The Subscriber Database can also be used to identify more environmentally friendly vehicles such as those involved in WP12.2.

M14: Lessons learned

Park by Phone has proven to be very popular with the users who value the quick and convenient payment method for on-street parking. The implementation schedule proposed by Cork City Council proved to be too ambitions and did not fully take into account the time required to enact changes in legislation and to overcome technological issues. Since the system has gone live it has become evident that a planned sustained marketing campaign is required in order to promote the wider use of Park by Phone among Cork motorists.

Having and maintaining a good working relationship with those charged with implementing a new system like this is very important. It is important to clearly explain how the enforcement of a phone-based parking fits into the traffic wardens normal duties and how the new working procedures are provided for within their terms and conditions of employment.

It is also important to investigate all aspects of the final system design, so even if there are some delays during negotiations, some work continues to design/source tickets, investigate how to configure information technology systems to process the signal output, etc.

It was discovered that Irish weather conditions require a higher standard of water imperviousness for equipment used outdoors. In particular, the ticket printers which the wardens must use to enforce the system had to be upgraded to optimise the efficiency of printing tickets in the rain.

MEASURE-LEVEL RESULTS	
Measure title: Improved Network Management	**Project: MIRACLES**
Measure number: 11.2 Park by Mobile Phone	**City: Cork**
Initially Park by Phone was implemented in a small area of the city centre. After implementation it was considered desirable to greatly expand the area covered.	
Contact Point .www.corkcity.ie/services/depts/dept_road_miracles.html MIRACLES, Traffic Division, Cork City Council, City Hall. ☎ 021 4924457	

7. Measure 12.2

MEASURE-LEVEL RESULTS	
Measure title: Municipal Fleet Vehicles	**Project: MIRACLES**
Measure number: 12.2 Clean Vehicles	**City: Cork**

The Measure – what is it about?

M1: Measure objectives:

The objectives for Measure 12.2 were to:

- Investigate the current and future benefits accruing from the use of less polluting vehicles in an Irish context.
- Promote the use of clean fleet vehicles in Ireland.
- Assess the pros and cons associated with a range of lower emission vehicle technology options in an Irish context.
- Convert at least 5-10 vehicles (2 – 5% of fleet vehicles) to lower emissions.
- Monitor the socio-environmental, economic and technical sustainability of the clean fleet options being investigated.
- Promote the use of lower emission vehicles locally, nationally and internationally.

M2: Measure description:

It was proposed to convert at least 5 vehicles to run on lower emission fuel such as LPG. Other candidate fuels under consideration included: cold pressed rapeseed oil and compressed natural gas. Rapeseed oil was chosen and 17 council vehicles underwent the conversion process. Unfortunately by the end of 2004, 6 of these vehicles had dropped out of the project due to technical reasons. These problems were solved for 5 of these vehicles in 2005.

In particular, MIRACLES would assess the opportunities, government policy and likely economic costs associated with electric vehicles being used for goods distribution with reference to the ZEUS and ELCIDIS Project Reports in addition to the projects underway by Power Electronics Ireland (PEI) Technologies and the Engineering Department UCC.

The Implementation – how was the measure implemented?

M3: Innovative aspects:

Previously to the MIRACLES project, Cork City Council's fleet consisted of petrol and diesel fuelled vehicles. It was considered that the use of lower emission fuels for City Council vehicles would be perceived locally as something highly innovative because very few people living in Cork are even aware of the existence of lower emission fuels such as LPG, CNG or the whole family of vegetable oil based fuels. Pure vegetable oil was never before used by local authority vehicles in Ireland, (bio diesel was used before in County Council vehicles and during the MIRACLES inception period, a trial of waste cooking oil in County Council boilers and vehicles was underway.) Vehicle conversion kits had to be specially developed by the supplier for some of the fleet's vehicles, as these models had not been converted before.

Information about the Clean Fleet vehicles was also disseminated as part of the awareness raising activities of WP 10.1, resulting in interest in the scheme from members of the public, local press, other local authorities, alternative fuel suppliers, other European Cities and academic researchers locally, nationally and internationally.

M4: Situation before CIVITAS:

Prior to MIRACLES Cork City Council owned approximately 250 vehicles shared amongst 8 different subsections of the local authority. The only fuels used were petrol (leaded and unleaded) (2.5%) and diesel (duty paid and duty free) (97.5%).

Prior to MIRACLES, pure vegetable oil was never before used in local authority vehicles in Ireland.

MEASURE-LEVEL RESULTS	
Measure title: Municipal Fleet Vehicles	**Project: MIRACLES**
Measure number: 12.2 Clean Vehicles	**City: Cork**

(Bio-diesel was used before in County Council Vehicles and during the MIRACLES inception period, a trial of waste cooking oil in County Council boilers and vehicles was underway.). The MIRACLES project was seen as an enabler for other lower emission applications in Ireland.

M5: Design of the measure:

Initially research was carried out to:

- Identify and assess the key environmental impacts associated with the use of petrol and diesel in conventional vehicles (this would compliment research being carried out for the WP 10, Sustainable Transport Promotion).
- Identify and assess the advantages/disadvantages associated with various clean fleet options.
- Compare these with the key environmental, social and economic concerns relevant to the proposal and thus select which clean fleet option(s) to implement with MIRACLES funding.
- A report summarising some of the findings of this research was produced and made available to the public.
- New procedures / infrastructure for re-fueling were established, vehicles then be replaced or converted. In the latter case it was hoped that City Council staff would receive some training to carry out or maintain the conversions.
- The vehicle operation and refueling procedures was reviewed periodically and some testing of converted engines / vehicles was carried out.

M6: Actual implementation:

The initial assessment of all the clean fleet options commenced immediately through contacts between City Council staff and a range of alternative fuel suppliers and clean fleet experts. Options investigated included: CNG, LPG, electric propulsion, hydrogen fuel cells, pure plant oil, waste cooking oil, bio-diesel and ethanol.

It was decided not to proceed with the use of CNG because the costs of establishing the requisite refuelling infrastructure were deemed to be prohibitive and it would not have been practically possible to adapt the fuel depot in use by the City Council to accommodate the high pressure gas supply system. LPG was ruled out because the use of vehicles with a petrol tank had been almost entirely phased out. Similarly, the use of an electric hybrid vehicle would not have made any significant contribution to reducing the fleets' vehicle emissions since the only available model (the Toyota Prius) did not offer any clear replacement for the Council's fleet of vans and trucks. The all electric Citroën Berlingo might have been a better replacement vehicle, but in the end it was decided that more benefit could be created with the available budget by investing in a bio-fuel option. The feasibility of introducing a hydrogen fuelled bus fleet for Cork had previously been examined and although the results indicated that the proposed implementation models would be technically feasible, the high investment costs required were outside of current budgets. Research indicated that using bio-fuels as a vehicle fuel represented the most efficient way to reduce the greenhouse gas emissions associated with transport. The use of waste cooking oil or ethanol derived from waste would yield the greatest overall environmental impact because of the potential to reduce the impact of problematic or hazardous wastes. Ultimately, cold-pressed vegetable oil was chosen because: It could be used with the single tank conversion kit. Pure plant oil (PPO) would be cleaner burning than waste oils, was more readily available from Irish producers than bio-diesel at the time and was generally cheaper than bio-diesel.

Prior to the fleet conversions, a meeting was organised with the drivers' supervisors on October 2002 to inform them about the proposed changes. A supplier of vegetable oils, who would help organise conversions delivered a presentation, with a viewing of the engine. Building on this, all of the drivers were invited to attend training on Driving Energy Awareness in December 2002. Unfortunately, it was not possible for all the drivers to attend these preliminary sessions.

The public were kept informed of the progress of these investigations through a number of means, such as a display of alternative vehicles as part of 'In Town Without My Car Day' in September 2002;

MEASURE-LEVEL RESULTS	
Measure title: Municipal Fleet Vehicles	**Project: MIRACLES**
Measure number: 12.2 Clean Vehicles	**City: Cork**

radio interviews, press releases, and presentations during Energy Awareness Week; presentations and clean vehicle presentations at conferences. An analysis of the vehicle options examined was summarised in a presentation to the CIVITAS Forum in 2003.

Further and more in-depth research was carried out into the use of renewable oils for fuel - one of the main issues was that of bio-fuel taxation. Also in November 2002 a number of vehicles were nominated from various departments for conversion to run on cold pressed vegetable oil. Details about the engine components, type, size and year were sent to the engine conversion company. In May 2003, 6 City Council vehicles were converted to run on vegetable oil and City Council employees were trained on installation of conversion kits. These were then used for the conversion of 11 other vehicles, bringing the total converted fleet to 11 Fiat Ducatos, 4 Ford Couriers, 1 VW Transporter and 1 Isuzu NQR.

Technical changes during the course of the project to ameliorate problems found in the conversion process are detailed in M11, M12 and M14. Unfortunately one vehicle had to have its conversion reversed due to the position of the engine and 5 others temporarily dropped out of the project due to technical problems. In 2005, as problems with 5 of these vehicles were solved, they continued running on bio-fuel. A blend of 25% diesel and 75% RSO was used until November 2005 when pure RSO was used.

M7: Deviations from the plan:

One of the original 17 converted vehicles (an Isuzu NQR) had to have its conversion kit entirely removed because there were so many problems with the engine.

Drivers of the Fiat Ducatos experienced difficulties with cold starting of engines into the Autumn of 2004. As a result, by Autumn 2004 six vehicles had withdrawn from the project. In 2005, as problems with 5 of these vehicles were ameliorated, these vehicles were put running on the fuel again.

The excise duty waiver applied for from the government in 2004 was not granted. In 2005 a new scheme was introduced, whereby the oil supplier received a waiver on bio-fuel provided to a list of his customers (including Cork City Council).

The Evaluation – how was it done and what are the results?

M8: Method of measurement:

Various tools were used to evaluate the 12 indicators for this measure. Survey work took place in December 2002 to establish the Baseline Scenario, which included an assessment of the records for the vehicles undergoing the conversion. This assessment gathered such information as the fuel usage and costs, reliability and accident records for the fleet. The frequency of measurement and exact source of data is detailed both in the Cork Local Annex (Deliverable 4.1) and the Cork Baseline 2002 Report, which is available on request.

Survey work was repeated in 2003, 2004 and 2005 to monitor the Ex-Post situation. Emissions testing, fuel usage, reliability assessment, user acceptance and operator acceptance surveys were carried out. Interviews and focus groups provided information on the acceptance views of various user groups and operators. The frequency of measurement and exact source of data is detailed in the Cork Local Annex (Deliverable 4.1). Further details can be found in the Cork Ex-Ante Report, which is available on request.

M9: Achievement of quantifiable targets:

It was proposed to convert at least 5 vehicles to run on lower emission fuel (rapeseed oil). 17 vehicles underwent the conversion process, unfortunately 6 of these vehicles dropped out during the course of the project due to technical reasons. In 2005, problems with 5 of these vehicles were solved, these vehicles were running on bio-fuel again. This achieved a 6 % conversion of City Council fleet vehicles running on lower emission fuel (2- 5% of fleet vehicles were originally proposed to be converted).

MEASURE-LEVEL RESULTS

Measure title: Municipal Fleet Vehicles	**Project: MIRACLES**
Measure number: 12.2 Clean Vehicles	**City: Cork**

M10: Achievement of evaluation-related milestones:

- The 2002 Baseline evaluation took place in December 2002. This established a 'before' scenario for the Measure. This information included total fuel usage, fuel costs and reliability and accident rates surveys.
- Annual information on accident rates and reliability was gathered throughout the course of the project.
- Monitoring of the impacts took place by user acceptance questionnaire and operator acceptance discussions in January and December 2004 and the collection of quantitative information such as fuel usage and efficiency.
- Finally, the ex-post acceptance surveys were carried out in May 2005 with a user acceptance focus group. This was conducted again in January 2006.
- Detailed Gantt charts showing the frequency of measurement of each indicator can be found in the Cork Local Annex (Deliverable 4.1).

M11: Report on the measure results:

The indicators for the evaluation of Measure 12.2 are broken into 5 sections; Economy, Environment, Safety, Acceptance and Transport. Many of these indicators are evaluated using both quantitative and qualitative data collection methods. A full explanation of the indicators and how they were quantified for 2002 Baseline Scenario is available in the Cork Baseline Report. Similarly for the Ex-Ante evaluation, a full explanation of the indicators and how they were quantified for the Do-Nothing and MIRACLES (Do-Something) 2006 is available in the Cork Ex-Ante Report.

WP 12.2 Municipal Fleet Vehicles Evaluation

Indicator (Units) {*Meteor Core Ind}		Baseline 2002	Do Nothing 2006	MIRACLES 2006	Ex-Post 2005
C12.2/ Env1a	Emissions [CO2,CO,PM10,NOX] (ug/m^3) {5-11}	N/A	N/A	CO_2 emissions should be reduced by approximately 93 tonnes per annum	CO_2 emissions reduced by approximately 55 tonnes per annum
C12.2/ Env2a	Change in vehicle fuel efficiency (MJ/vkm) {3-4}	N/A	N/A	Engine power 7-20% higher. Engine torque 11-20% higher	Tests to be completed Winter 2005
C12.2/ Env2b	Change in total fuel use (GJ) {3-4}	2,200 L/veh/yr	N/A	Total rapeseed oil 83,764L. Diesel consumption 47,000 L/month	~ 50,000L rapeseed oil
C12.2/ Accp1a	Operator acceptance rating (Index) {13-14}	N/A	N/A	Positive	Positive
C12.2/ Accp2a	User acceptance rating (Index) {13-14}	N/A	N/A	Positive	Neutral
C12.2/ Tran1a	Reliability of vehicles (%) {18}	98%	98%	98%	Reliability of converted vehicles lower due to initial conversion problems

MEASURE-LEVEL RESULTS

Measure title: Municipal Fleet Vehicles | **Project: MIRACLES**

Measure number: 12.2 Clean Vehicles | **City: Cork**

C12.2/ Saf1a	Accidents (No./yr) {20}	5 in 2002 (91 for whole fleet)	Average 80 per year	Average 80 per year	2 in 2004, (103 in 2004, 88 in 2003 for whole fleet)
C12.2 /Econ1a	Infrastructure Purchase cost (€) {1-2}	N/A	N/A	€16,370	€16,370
C12.2/ Econ1b	Support Infrastructure cost (€){1-2}	N/A	N/A	€568	€568
C12.2 /Econ2a	Operating cost (€) {1-2}	N/A	N/A	€103,278	€52,165
C12.2 /Econ3a	Fuel cost per km (€/km) {1-2}	Diesel €0.698 per litre	Diesel €0.98per litre	Diesel €0.98per litre; rapeseed oil €1.27 per litre	Diesel €0.995per litre; rapeseed oil €0.87 per litre
C12.2 /Econ4a	Temporary Number employed (Number)	N/A	N/A	1 person	1.5 people

N/A – Not applicable. {Meteor Core Indicator} numbers are proxy indicators as information was not available in the details requited by Meteor.*

Table 1 - Summary of Ex-Ante and Ex-Post indicators for Measure 12.2

Table 1 shows a summary of the results for the Baseline, Do-Nothing and MIRACLES Scenarios as well as the Ex-Post 2005 results at indicator level. As can be seen from Table 1 the Clean Vehicles Measure was expected to have beneficial effects in the encouragement of more sustainable vehicles by the conversion of at least 5 city fleet vehicles to run on lower emission fuel (rapeseed oil).

The use of this lower emission fuel would effect the environment with emissions decreasing (C12.2/Env1a). 17 vehicles underwent the conversion process, unfortunately 1 of these vehicles dropped out during the course of the project. Initially, the only vehicle with significant problems was an Isuzu NQR; the injectors of this engine started leaking and the nozzles were coked after 3 weeks. The injectors and the fuel filters were replaced and as a precaution, the vehicle reverted to diesel for its peak summer period. Ultimately it was decided to have the conversion completely reversed as the changes made did not seem to solve the problems for the driver. It should be noted that this was a relatively old vehicle, with an internal engine under the seat; it was also heavily used, sometimes on rough terrain, hauling variable loads.

5 vehicles stopped using bio-fuel for some months as some of the Fiat Ducato vans were significantly slower to start up. On investigation, it was found that there were tiny air leaks in some of these fuel supply lines because of the extra strain imposed by the more viscous fuel, these fuel pipes were then replaced. The chief concerns raised, by the drivers during user acceptance meetings, related to the possible health impacts on drivers, extra visible smoke, smell of the exhaust, power losses, and concerns that the vehicles were more likely to cut out abruptly. Subsequently these experiences with the converted vehicles were collected through questionnaires and monitored through follow-up meetings. Upon investigation, it was discovered that some of the vehicles did not have their oil filters changed in the month after conversion. Furthermore the idling speed of the engines had to be increased and further adjustments to the injectors had to be made to the engines. The drivers also requested that they be allowed to add some diesel to the vegetable oil as they had observed that this seemed to greatly reduce the problems with cold-starting and smoke. Initially the drivers were given permission to experiment with alternate fills such that there was always approximately 25% diesel in the tank. This was the ratio which they deemed the most successful, so subsequently 25% diesel was added to the vegetable oil tank and all the drivers were asked to use this tank exclusively. These 5 vehicles then continued using bio-fuel. The refuelling procedures changed in November 2005, pure rapeseed oil replaced the blended fuel and refuelling took place directly from the original tanks, thereby minimising contamination.

MEASURE-LEVEL RESULTS

Measure title: Municipal Fleet Vehicles	Project: MIRACLES
Measure number: 12.2 Clean Vehicles	City: Cork

To combat the difficulties with cold starting of engines in the Fiat Ducatos, the fuel tanks were cleaned, which resulted in the discovery of fine mesh gauze in the fuel tank which impeded the flow of fuel from the tank. As a result this gauze (and the rest of the tank) had become clogged with a residue: described as a "waxy dirty substance". After the removal of the gauze in Cork City Council's Ducato vehicles, they ran more smoothly, with less smoke but there were still longer than expected delays at start-up.

Test results from T.E. Laboratories found evidence of some trace heavy metal contamination of the fuel in the engines, not present in the virgin fuel. (Iron and lead were particularly high as indicated in Table 2). Table 2 also contains the levels of contaminants detected and are compared to the threshold values.

Heavy Metal	Cautionary Level	Serious Contamination	Actual Level		
			Fiat Ducato	**Ford Courier**	**Virgin RSO**
Fe	75	100	457	135	47
Pb	30	40	315	263	2
Cr	*10*	*20*	*17*	*47*	*3*

Table 2 - Test results from T.E. Laboratories on City Council Converted vehicles

As can be seen, the pure rapeseed oil was uncontaminated before supply to the fuel tank indicating that the contamination was occurring in the fuel supply system at the refuelling depot and/or in the fuel tank. One possible explanation was that some of the leaded diesel previously stored in the refuelling tanks (used to dispense the vegetable oil) could have been to blame. This would have explained why the virgin fuel showed no metal contamination. There was however visible debris and some water contamination in the virgin RSO. For this, the laboratory advised the garage to check crank-case and oil pressures. Further guidance about the levels and associated risks was sought and a course of remedial action was progressed. (Checking crankcase and oil pressures, re–cleaning the refuelling tanks etc.) Following the cleaning out of the Ducato engines, the start-up delays with the Ducatos were not satisfactorily shortened. Following investigation the energy management system in the engine was not heating the supply system as efficiently as possible. This was remedied by installing a parallel relay to execute the heating function.

In July 2004, the University of Limerick delivered a presentation on emissions testing results. According to the results, although some pollutants were a little higher from the RSO engine for a few seconds at start up, the steady state emissions were similar for all pollutants tested except CO_2 (RSO is considered CO_2 neutral). The engine power and torque however were actually 5% to 10% higher when running on RSO or a blend (25% diesel, 75% RSO). Unfortunately the researcher had some concerns about the emissions testing kits response time. Control tests called into question the reliability of the "start-up emissions" test results because during equipment initialisation, pure air sometimes tested higher in pollutants than exhaust fumes. More reliable tests could only be carried out by vehicle manufacturers. This might also have been affected by the lack of removal of the fine gauze in the Ducatos, the contamination of the supply tank and other problems resolved after the testing. Also, a comprehensive literature review of similar fuel test comparisons was presented; all of which provided results supporting claims of environmental benefits associated with RSO. All research results are available for inspection on request from Cork City Council.

The reliability of the converted vehicles initially would have been low due to the starting difficulties and gauze filter problems. Following modifications, the reliability of the converted vehicles has increased. However, there are still some problems with the fuel gumming, the installation of an in line filter away from the fuel tank makes it easier to repair the fault.

MEASURE-LEVEL RESULTS

Measure title: Municipal Fleet Vehicles	Project: MIRACLES
Measure number: 12.2 Clean Vehicles	City: Cork

The anticipated user acceptance for the project (C12.2/Accp2a) was "positive". However, Ex-Post surveys and focus groups found that the acceptance was "negative" to "neutral".

There were two reported accidents to converted vehicles in 2004; two accidents were also reported in 2003. All accidents to the converted vehicles were minor material damage accidents and not related to the conversion. For the entire fleet the number of reported accidents over the last number of years are as follows; 90 in 2002, 88 in 2003 and 103 in 2004. There were 49 accidents reported for the entire fleet in 2005, up until July.

In spite of the problems experienced during the course of the implementation of this Measure, Cork City Council intends to continue with the use of bio-fuel. Valuable insights were gained through the course of the project which will be of use to any City contemplating a similar project. The council is also going to experiment with the use of bio-diesel. In August 2005 it sourced some rapeseed-methyl-ester from a local company, who had previously used the fuel in a Mitsubishi. The fuel is being offered for free to trial in a Mitsubishi L200 and has been used successfully. Consequently, the City Council may decide to use bio-diesel for its new fleet which it will be purchasing in 2007, but this will depend on price availability and reliability. Car Manufacturers are generally reluctant to uphold Car Warranties for vehicles running on bio-fuels whereas converted kit suppliers provide back up services. In the short-term therefore some converted vehicles will continue to be used and further conversions may still be carried out.

Lessons Learned – what do other cities, other actors and the EC have to consider?

M12: Barriers and drivers of the measure implementation / Process evaluation

In early 2003, the City Council raised concerns about the running costs of the converted vehicles since the alternative fuel appeared to be at least 33% more expensive than the diesel being purchased at the time by the City Council. Submissions outlining the case for a tax reduction on this type of CO_2 neutral fuel were also made to the Department of Finance, the Department of Marine and Natural Resources, Sustainable Energy Ireland and political representatives. The issue of bio fuel taxation reform was raised at roundtable discussions in the Irish parliament in February 2003 and the MIRACLES project office provided information to this discussion which highlighted the incompatibility of the Irish situation with the latest EU directives. In early 2004, the Finance Act was amended to allow for the use of rapeseed oil in certain projects. By then the RSO was around 50% more expensive than the diesel being purchased by Cork City Council. Cork City Council's exemption was approved in Autumn 2005.

Various technical problems with the conversion process and vehicle suitability as well as amelioration techniques are detailed in M11. The suitability of converted vehicles should be determined with reference to the terrain as well as the load carried.

The use of bio-fuels is one of the most efficient ways to reduce the greenhouse gas emissions associated with transport. It is also a good way to help boost the indigenous economy in places where there are few if any fossil fuels. Cork City Council was interested in assessing the opportunities associated with lower emission vehicles in order to promote sustainability in Cork.

M13: Interrelationships with other measures

Some investigation was carried out to source clean buses for the Park and Ride measure (WP7.3). CIVITAS partners provided great assistance with this. Ultimately standard double-decker buses were used for the first contract but it is hoped that 'cleaner' buses may be used in the future. Furthermore, Cork City Council will explore options for permitting access for vehicles using lower emission fuels/electric propulsion.

M14: Lessons learned

MEASURE-LEVEL RESULTS

Measure title: Municipal Fleet Vehicles	**Project: MIRACLES**
Measure number: 12.2 Clean Vehicles	**City: Cork**

The use of biofuels is one of the most efficient ways to reduce the greenhouse gas emissions associated with transport. It is also a good way to help boost the indigenous economy in places where there are few if any fossil fuels. For the use of bio-fuel to be sustainable, there must be political support to ensure that the cost of the fuel is competitive with fossil fuels. Pressure from the EC on national government to deliver on the bio-fuels directive targets may be necessary to achieve these ends.

It was found that emissions testing of the converted vehicles proved difficult and unreliable.

Cork City Council wishes to ensure that others benefit from the mistakes and lessons learned during this project, For instance, prospective users of vegetable oil fuel should investigate the suitability of the engine type, with regard to the fine mesh gauze filter problem as well as the location of the engine with relation to the driver – to avoid some of the teething problems found in this project. The system for heating the fuel supply line should also be very carefully checked to ensure that it functions as intended. Following conversion it is also very important to replace the oil filters and any other fine mesh gauze filters in the tank as they will clog up a few weeks after the conversion as the vegetable oil cleans the engine. It is also very important to ensure that the engines idle at a higher speed and advisable not to convert vehicles where the engine is open to the area where the driver sits.

It was found vital to explain the projects advantages and disadvantages to the drivers involved in any such trials; drivers should be regularly consulted to provide feedback.

Contact Point

.www.corkcity.ie/services/depts/dept_road_miracles.html

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8. City-level Results - Economy

CITY-LEVEL RESULTS	
Indicator Group: Economic	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

C1: Local objectives and quantifiable targets:

The MIRACLES measures added in the enhancement of economy of the city centre regarding business, tourism and travel. There were no specific targets for economic indicators but it was hoped that the improvements in sustainable transport and the improved environment would result in a more prosperous and pedestrian friendly city.

C2: Indicator description:

The economic costs and benefits of each the MIRACLES Measures are examined.

Indicator 1 – Operating revenues:
This indicator is limited to quantifying the change in revenue of the local public transport company.

Indicator 2 – Operating costs:
This indicator is limited to quantifying the change in costs of the local public transport company.

C3: Context and relevance:

These indicators give a picture of the scale of investment of the MIRACLES project in the city.

The Evaluation –what are the results?

C4: Method of measurement:

Indicator 1 – Operating revenues and Indicator 2 – Operating costs:
The operating revenues and costs of the local public transport company, Bus Eireann, have been provided for 2002 the Baseline year, 2003 and 2004.

The detailed costs and manpower for each of the Measures are summarised below and they are further detailed in the Measure Level Templates. This information was identified through data supplied by Cork City Council.

C5: Achievement of quantifiable targets:

There were no quantifiable targets for these indicators.

C6: Report on results:

Indicator 1 – Operating revenues; Indicator 2 – Operating costs.
Information on the operating revenues and costs of public transport services was provided by the local bus company, Bus Éireann. The income for 2002 from fares on the Cork City and Suburban Routes was €8.4 million. The income for 2003 from fares was €9.1 million, and income for 2004 was €9.8 million. Over this time individual fares rose by 9% in 2002 and 2.75% in 2004. Therefore the revenue rise from 2002 to 2003 can be solely linked to the fare rise. However, if patronage had remained static from 2003 to 2004 only €250,000 extra would have been generated by the fare rise alone. The remaining €450,000 increase in revenues must be largely attributable to an increase in patronage. It was not possible to determine the operational costs for the Cork City and Suburban Routes but they are estimated as 133% of the operating revenue.

CITY-LEVEL RESULTS	
Indicator Group: Economic	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

Additional information was provided for the operating revenues and costs of each of the six MIRACLES measures in Cork, further details at Measure level can be found in Section 2 of Deliverable 4.2.

The economic benefits for the city from MIRACLES were difficult to identify individually, as parallel projects such as the City of Culture 2005 and Green Routes (quality bus corridors) played an integral part in the enhancement of the economy of Cork City. The project promoted inner city shopping and tourist trade. The pedestrian footfall counts on Patrick's Street pre and post MIRACLES demonstrate an increase in pedestrian numbers. (Up to a 15% increase per annum seen in the peak hour).

Increased urban accessibility and an improvement of citizens' quality of life should be partially achieved through the provision of extra cycle racks, seats and benches in the Clean Zone. The footpath widths were widened substantially, thereby increasing the number of pedestrians in the City Centre. (In May 2005, the evening peak displayed a 53% increase on December 2002). The widening of footpaths was greeted very positively; over 80% of user survey respondents rating them as "much better" or "slightly better". The overall opinion of the redesign and the opinion of visual improvement were very positive with over 60% rating it as "much better". The reduction in lanes and provision of cycling parking facilities (encouraged the increase in cyclist numbers (the 226 spaces provided far exceeded the 40% increase planned).

The representatives of business organisations also strongly supported the Clean Zone. The redesign supported the retention and expansion of business in the city centre, which was important due to the increase in suburban shopping centres. The city centre was made more accessible by the use of Park and Ride, Park by Phone, the increase in cycling facilities, improved public transport facilities, and a more attractive environment in which to shop.

The wider pedestrian areas and the modern more disabled friendly surfaces, tactile guidance, etc. were expected to be easier and safer for people. It created extra space for hosting cultural events/recreational activities (e.g. a street fair was held on the new streetscape to mark the "Day of Welcomes", when Cork celebrated the expansion of the EU).This can be objectively witnessed by the many visitors to the city centre during the many open air cultural events hosted on the street. The increase in tourists partly reflects City of Cultures activities, however many of these were dependent on the use of the Clean Zone and expanded pedestrian areas.

Initially just St. Patrick's Street was to be re-designed (WP5.1) however; in 2004 the Clean Zone was extended to include Oliver Plunkett Street and the upper section of the Grand Parade. This is the largest of the Cork Measures. The expanded Clean Zone cost about €32 million, with St. Patrick's Street costing approximately €13.5million, Oliver Plunkett Street €4million and the Grand Parade €14 million.

Infrastructure purchase costs for St. Patrick's Street were approximately €4.7 million with approximately €1.2 million of this being part funded MIRACLES (following adjustment to extract the depreciated value over the life of MIRACLES). Labour costs were in the region of €8 million and plant costs €2 million. 25 people were employed temporarily on the scheme.

For WP7.3, a new Park and Ride scheme was implemented with contract costs of €1.8 million over 3 years, power costs are approximately €40,000 per year and maintenance costs €75,000 per year. 5 people are employed on a long term basis for this Measure. It is hoped that no operating subsidy will be required for this Measure as it aims to be self-financing. Revenue comes from the user paying €5 per day for use of the service (Park and Ride bus, parking and up to 4 passengers included). After the first 50 weeks of operation by November 2004, these revenue streams were sufficient to match the weekly running costs. However higher operational costs were predicted for 2005 in anticipation of

CITY-LEVEL RESULTS

Indicator Group: Economic	Project: MIRACLES
Evaluation Area: Cork City	City: Cork

The Indicator – what is it about?

rising gas and electricity costs. For the first six months of the year income was around 20% lower than predicted running costs. In September weekly revenue began to match predicted expenditure and it is expected that the cumulative shortfall will be less than 6% by end of year.

Measure 10.1, provided extra cycling facilities in the city centre, infrastructure purchase costs were over €230,000 due to the expansion of this scheme to provide (all cycle stands in the Clean Zone are part funded by MIRACLES) extra cycle parking facilities. Administrative costs were €68,000 which included publicity of various promotional schemes. The staff resources explicitly applied to this task amounted to approximately 40% of a person working fulltime.

The promotion of sustainable commuting habits in WP10.2, through Travel to Work and Travel to School projects, cost €37,000 and 1 person was employed temporarily on the Measure.

The use of mobile phone parking technology in WP11.2 cost €310,000 and 2/3 person were employed temporarily on the Measure.

Seventeen Cork City Council Fleet vehicles were converted from diesel to rapeseed oil in WP12.2, infrastructure purchase costs were €17,000 and operating costs were €52,000. In 2004 a blend of 25% diesel and 75% rapeseed oil was used in the converted vehicles, although by November 2005 the vehicles began to use 100% rapeseed oil again. The cost of the fuel was a major issue in the cost-effectiveness of this Measure. In early 2004, the Irish government finance act was amended to allow for a tax exemption on the use of rapeseed oil in certain projects. By then the RSO was around 50% more expensive than the diesel being purchased by Cork City Council. This was approved by Autumn 2005 (diesel cost €0.995/L and rapeseed oil €0.87/L post tax exemption).

Measure level costs were examined under the following indicators:
Infrastructure Purchase cost (€) {1 – 2} - C5.1/Econ1a, C7.3/Econ1a, C10.1/Econ1a, C10.2/Econ1a, C11.2//Econ1a, C12.2//Econ1a, **Power cost** (€/year) {1 – 2}- C5.1/Econ2a, C7.3/Econ2a, **Labour cost** (€) {1 – 2} C5.1/Econ2b, **Plant cost** (€){1 – 2} C5.1/Econ2c, **Maintenance cost** (€){1 – 2} - C5.1/Econ3a, C7.3/Econ3a, **Contract cost** (€){ 1-2} - C7.3/Econ2b, **Subsidy** (bus) (€/km/year) {1-2} - C7.3/Econ4a, **Administrative cost** (€) {1-2} - C10.1/Econ2a, C10.2/Econ2a, **Operating cost** (€/pkm) {1-2} - C11.2/Econ2a, C12.2/Econ2a, **Support Infrastructure cost** (€){1-2} - C12.2/Econ1b, **Fuel cost per km** (€/km) {1-2} - C12.2//Econ3a.

Long term Number employed (No.) - C7.3/Econ6a, **Temporary Number employed** (Number) {1 – 2} - C5.1/Econ4a, C7.3/Econ5a, C10.1/Econ3a, C10.2/Econ3a, C11.2//Econ4a, C12.2//Econ4a.

Lessons Learned – what do other cities, other actors and the EC have to consider?

C7: Lessons learned:

Operating costs and revenues from the local bus company is commercially sensitive information and hard to identify and monitor.

It was found that cost of the Park and Ride service (WP7.3) is a significant user factor, cost of €5/day for a vehicle and up to 4 passengers. Users of the Park and Ride service should be offered a significant saving compared with inner city parking for long stay parkers. (In Cork users start saving if they park for over 2 hours and even greater savings if they availed of discounted monthly or annual tickets). 56% of users surveyed in 2004 cited the cheaper price as the reason for using Park and Ride. Regular and sporadically intensive advertising of the site on signs, local radio stations and in newspaper advertisements etc also greatly helped. Attractive adverts were placed on the back of the eye-catching distinctive buses and many people were tempted to trial the service during mobility week when the service was offered for free.

CITY-LEVEL RESULTS	
Indicator Group: Economic **Evaluation Area: Cork City**	**Project: MIRACLES** **City: Cork**
The Indicator – what is it about?	
The use of bio-fuels is one of the most efficient ways to reduce the greenhouse gas emissions associated with transport. For the use of bio-fuel to be sustainable, there must be political support to ensure that the cost of the fuel is competitive with fossil fuels.	
Contact Point .www.corkcity.ie/services/depts/dept_road_miracles.html ✉ MIRACLES, Traffic Division, Cork City Council, City Hall. ☎ 021 4924457	

9. City-level Results - Energy

CITY-LEVEL RESULTS	
Indicator Group: Energy	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

C1: Local objectives and quantifiable targets:

The local objectives and quantifiable targets were to increase in the diversification of the types and quantities of fuels used in the city. The general objective was to encourage sustainable commuting.

C2: Indicator description:

Indicator 3 – Vehicle fuel efficiency
This indicator measures the fuel used per vehicle and is directly related to the composition of pollutant emissions.

Indicator 4 – Fuel mix:
This indicator measures the share of each fuel type and alternative fuels.

C3: Context and relevance:

Previous to the MIRACLES project, Cork City Council's fleet consisted of petrol and diesel fuelled vehicles. It was considered that the use of lower emission fuels for City Council vehicles would be perceived locally as highly innovative because very few people living in Cork are even aware of the existence of lower emission fuels such as LPG, CNG or the whole family of vegetable oil based fuels. Pure vegetable oil was never before used by local authority vehicles in Ireland. Vehicle conversion kits had to be specially developed by the supplier for some of the fleet's vehicles as these models had not been converted before.

The Evaluation –what are the results?

C4: Method of measurement:

Indicator 3 – Vehicle fuel efficiency & Indicator 4 – Fuel mix:

Various tools were used to evaluate the Baseline Scenario. Survey work which took place in December 2002 included an assessment of the records for the vehicles undergoing the conversion. This assessment gathered such information as the fuel usage and costs, reliability and accident records for all the Cork City Council fleet. The frequency of measurement and exact source of data is detailed both in the Cork Local Annex (Deliverable 4.1) and in the Cork Baseline 2002 Report, which is available on request.

Survey work was repeated in 2003, 2004 and 2005 to monitor the Ex-Post situation. Emissions testing, fuel usage and a reliability assessment were carried out. Further details can be found in the Cork Ex-Ante Report, which is available on request.

Monitoring of the impacts also took place in January and December 2004 and the collection of quantitative information such as fuel usage and efficiency. Finally, the ex-post information was collected in May 2005 and January 2006.

C5: Achievement of quantifiable targets:

There were no quantifiable targets for this indicator group.

C6: Report on results:

CITY-LEVEL RESULTS

Indicator Group: Energy	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

Indicator 3 – Vehicle fuel efficiency and Indicator 4 – Fuel mix:
An objective was to convert at least 2 – 5% of Cork City Council's vehicle fleet (approximately 250 vehicles, of which 97.5% were diesel and the reminder petrol in 2002) to run on lower emission fuel, 17 vehicles were converted during the course of the MIRACLES project (~7% of fleet) to run on a combined rapeseed oil (75%) and diesel (25%) blend. By November 2005 pure RSO was used.

Information related to energy consumption of the City Council fleet vehicles was provided by Cork City Council. An average of 2,200 litres of diesel was used per vehicle in 2002 (before conversion). Cork City Council records show that in 2003 441,727 litres of diesel (approximate use of 8,550 litres per week) were used for 250 vehicles. For 2004, a total quantity of 493,360 litres was consumed. (approximately 9,675 litres per week). From the 2003 and 2004 records it is predicted that for 2005 the diesel consumption will be 540,000 litres and for the first month of 2006 it will be 47,000 litres. Approximately 50,000L of rapeseed oil was used in the course of the Measure.

A study by the University of Limerick compared the exhaust emission profiles, torque and power of the vehicles while running on vegetable oil and diesel. This was presented to the Cork City Council in May 2004. Although fuel efficiency was not specifically measured, it was found that the power of the engines was 7-20% higher when running on vegetable oil, the relative increase decreased gradually with increasing engine speed. Similarly, the torque of the engines was 11-20% higher when running on vegetable oil. The relative increase decreased irregularly with increasing engine speed. In both cases, the results for pure rapeseed oil and the blended fuel were very similar, with the pure rapeseed oil slightly better in most instances.

Information on the fuel used by the public transport services was provided by the local bus company. The fuel consumption for the Cork City and Suburban Bus Fleet was 2.5 million litres of diesel in 2002, 2.7 million litres of diesel in 2003 and 2.8 million litres of diesel in 2004. This increased use mainly resulted from increased service provision.

Lessons Learned – what do other cities, other actors and the EC have to consider?

C7: Lessons learned:

The use of bio-fuels is one of the most efficient ways to reduce the greenhouse gas emissions associated with transport. It is also a good way to help boost the indigenous economy in places where there are few if any fossil fuels. However, for the use of bio-fuel to be sustainable, there must be political support to ensure that the cost of the fuel is competitive with fossil fuels. However, it was found that emissions testing of the converted vehicles proved difficult and unreliable.

By 2004, the rapeseed oil was around 50% more expensive than the diesel being purchased by Cork City Council. However, the Finance Act 2004 was amended to allow for the invocation of an excise duty waiver for bio-fuels used in certain projects. This occurred after many years of lobbying by various sectors of the industry and users including Cork City Council. Through CIVITAS further support for government action at national level was solicited. The waiver was introduced on such a restricted basis and it is felt that pressure from the EC on national governments to deliver on the bio-fuels directive targets must be maintained.

Cork City Council also wishes to ensure that others benefit from the mistakes and lessons learned during the Clean Fleet Measure, e.g. prospective users of vegetable oil as fuel should investigate the suitability of the engine type. The system for heating the fuel supply line should also be very carefully checked to ensure that it functions as intended. Another important lesson learnt was to convey to the end users of the new fuel (i.e. the drivers) the explanation of the projects advantages and disadvantages and consultation should occur regularly.

CITY-LEVEL RESULTS	
Indicator Group: Energy	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

Overall, the project demonstrated that the use of alternative fuels such as rapeseed oil was feasible for Cork City Council and provided a good demonstration for others. Indeed, Cork City Council hopes to continue using alternative fuels and expanding the clean fleet post-MIRACLES.

Sustainable commuting was further encouraged through a package of other MIRACLES measures which promoted cycling, walking, park and ride and car-pooling.

Contact Point

💻.www.corkcity.ie/services/depts/dept_road_miracles.html

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10. City-level Results - Environment

CITY-LEVEL RESULTS	
Indicator Group: Environment	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

C1: Local objectives and quantifiable targets:

The local objectives were to:

- Provide a safer, healthier, more comfortable environment for pedestrians and cyclists in the city centre and accessing it.
- Promote access to the city centre by public transport, as a viable alternative to making all such trips by car.
- Provide for the sustainable integration of cycling and walking with other urban transportation systems
- Investigate the current and future benefits accruing from the use of less polluting vehicles in an Irish context. Monitor the socio-environmental, economic and technical sustainability of the clean fleet options being investigated and promote the use of lower emission vehicles locally, nationally and internationally.
- Implement a parking system that is capable of discriminating in favour of more environmentally friendly vehicles.

The local quantifiable targets were to:

- Increase the numbers of cycle parking facilities within the city centre by at least 40%
- Convert at least 5-10 vehicles from the city's fleet (2 – 5% of fleet vehicles) to lower emission vehicles; without the MIRACLES project these conversions would not have taken place.
- Reduce traffic levels through the access-restricted zone by at least 2% - as compared to the Do-Nothing scenario.

C2: Indicator description:

Indicator 5 – CO levels, Indicator 6 – NO_x levels, Indicator 7 – Particulate levels, Indicator 8 – CO2 emissions, Indicator 9 – CO emissions, Indicator 10 – NO_x emissions, Indicator 11 – Small particulate emissions.

Air quality levels are quantified by the values of the following pollutants: Suspended particulates, Ozone, PM_{10}, Lead, Sulphur Dioxide, Nitrogen Dioxide, Nitric Oxide and Carbon Monoxide. This indicator also measures the public perception of air quality in the city centre through questionnaire surveys.

Indicator 12 – Noise perception.

The public perception of satisfaction with noise levels in the city centre was measured through questionnaires. In addition, noise measurement surveys were carried out.

C3: Context and relevance:

The CIVITAS measures in Cork aimed to provide a safer, healthier, more comfortable environment for pedestrians and cyclists in the city centre; this is directly affected by traffic levels, congestion and vehicle emissions. Air quality indicators and noise levels are therefore relevant to the objectives of the measures.

The Evaluation –what are the results?

C4: Method of measurement:

Indicator 5 – CO levels, Indicator 6 – NO_x levels, Indicator 7 – Particulate levels, Indicator 8 – CO2 emissions, Indicator 9 – CO emissions, Indicator 10 – NO_x emissions, Indicator 11 – Small particulate emissions.

The air quality indicator is reported annually at city level from the annual 'Air Pollution in Cork City

CITY-LEVEL RESULTS

Indicator Group: Environment	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

Report' by the Cork City Council Laboratory. Air quality levels are quantified by the values of the following pollutants: Suspended particulates, Ozone, PM_{10}, Lead, Sulphur Dioxide, Nitrogen Dioxide, Nitric Oxide and Carbon Monoxide These pollutants are measured in various city centre and peripheral locations.

This indicator also measured the public perception of air quality in the city centre through the CIVITAS questionnaires carried out in 2002 and 2005.

Indicator 12 – Noise perception.
The public perception of satisfaction with noise levels in the city centre was measured in 2002 and 2005 through the CIVITAS questionnaires. In addition Baseline noise measurement surveys were carried out in Patrick's Street in 2002. These surveys were repeated in December 2005, as well as public perception questionnaires.

C5: Achievement of quantifiable targets:

The quantifiable target to convert at least 5-10 vehicles (2 – 5% of fleet vehicles) to lower emissions vehicles has been achieved through Cork Measure 12.2. In total 17 vehicles were converted to run on lower emission fuel. This achieved a 6 % conversion of City Council fleet vehicles.

The quantifiable target to increase the numbers of cycle parking facilities within the city centre by at least 40% was exceeded. In fact the actual percentage increase achieved was closer to 4000%. The Baseline surveys indicated that prior to MIRACLES there were only 8 bicycle parking spaces in the city and this will be increased to 316 by end of project. The target increase in the numbers of cyclists was at least 10%. The actual increase was identified from LUTS classified traffic counts in October 2005, which identified a 47% increase in cycling across the inner cordon.

The reduction in the overall level of car traffic through the inner cordon was 3.3% on the Do-Nothing Scenario which exceeded the objective of a 2% reduction; this was identified from traffic volume counts carried out in December 2005.

C6: Report on results:

Indicator 5 – CO levels, Indicator 6 – NO_x levels, Indicator 7 – Particulate levels, Indicator 8 – CO2 emissions, Indicator 9 – CO emissions, Indicator 10 – NO_x emissions, Indicator 11 – Small particulate emissions.

The Cork City Council Laboratory produces an annual report on air quality in the City. Air quality levels are quantified by the values of the following pollutants: Suspended particulates, Ozone, PM_{10}, Lead, Sulphur Dioxide, Nitrogen Dioxide, Nitric Oxide and Carbon Monoxide These pollutants are measured at various city centre locations by Cork City Council. Table Env1 below shows the values for 2002.

CITY-LEVEL RESULTS

Indicator Group: Environment | **Project: MIRACLES**

Evaluation Area: Cork City | **City: Cork**

The Indicator – what is it about?

	Suspended Particulates	Sulphur Dioxide	Ozone	PM10	Lead	Nitrogen Dioxide	Nitric Oxide	CO
Units	**ug/m^3**	**ug/m^3**	**ug/m^3**	**ug/m^3**	**ug/m^3**	**ug/m^3**	**ug/m^3**	**mg/m^3**
Max	110	106	189		0.045			10
Values>250	0	0						
98%ile	54	52	71			70	118	2.5
Median	11	16						
Mean	15	18		26				
No. samples				350				
No>50 ug/m^3				23				
Range			0-189			0-134	0-611	
Average			33		0.016	28	20	0.6
50%ile			35			25	10	0.4
Max 8hr run avg								7.4

Table Env1 – Cork City Air Quality (Cork City Laboratory 2002).

Table Env2 gives the equivalent 2004 values; by comparing these figures it can be seen that:

Suspended Particulates have decreased from about 90% of the EU limits in the past and have now reduced to about 15%. This is considered to have mainly resulted from a ban on the sale of bituminous coal.

PM10 is used to monitor for particulates, results indicate compliance at about 50 % of the EU standard at present. The maximum and 98%ile figures for the year 2004 were substantially down compared with previous years.

Sulphur dioxide levels are quite low in Cork with the results being well within the EU limits. The maximum and 98%ile figures for 2004 were substantially down on previous years. However, according to the Cork City Laboratory; the monitor did not function well during 2004.

	Suspended Particulates	Sulphur Dioxide	Ozone	PM10	Lead	Nitrogen Dioxide	Nitric Oxide	CO
Units	**(ug/m^3)**	**(ug/m^3)**	**(ug/m^3)**	**(ug/m^3)**	**(ug/m^3)**	**(ug/m^3)**	**(ug/m^3)**	**(mg/m^3)**
Max	31	24	103		0.034			3.9
Values>250	0	0						
98%ile	22	16	80			72	100	1.2
Median	10	8						
Mean	10	8		22				
No. samples				336				
No>50 ug/m^3				9				
Range			0-103			0.2-174	0-492	
Average			39		0.02	27	18	0.4
50%ile			40			24	8	
Max 8hr run avg								2.7

Table Env2 Cork City Air Quality (Cork City Laboratory 2004.)

CITY-LEVEL RESULTS

Indicator Group: Environment	Project: MIRACLES
Evaluation Area: Cork City	City: Cork

The Indicator – what is it about?

Nitrogen dioxide average values are about 70% of the EU limit. The 98%ile has varied from 68 ug/m^3 in 2002, 65 ug/m^3 in 2003 and to 72ug/m^3 in 2004. Weather conditions may have been a contributory factor. The average concentrations are fairly stable at 25-30 ug/m^3. The concentrations of NO_2 are influenced by winter space heating as well as by traffic, the increase in car numbers on the city's roads should be increasing concentrations. Nitrogen dioxide concentrations were fairly stable for the last four years. The higher concentrations have declined slightly but the averages are about the same.

Ozone levels were at about 80% of the EU standard according to the Cork City Laboratory. Ozone levels can be strongly influenced by imported pollution and/or natural events. Average ozone concentrations appear to be slightly increasing.

Carbon monoxide levels were about 40% of the standard in 2004. Carbon monoxide concentrations were fairly stable for the last four years. The higher concentrations declined slightly but the averages were about the same.

Lead levels are about 9% of the EU standard. Average concentrations remained the same for 2002 and 2004.

Benzene levels were about 15% of the EU standard. Benzene derives mainly from traffic fuels. The impression of the last three years is of a fairly stable regime. Fig Env1 below shows a graph of the benzene levels in the city centre for the last four years.

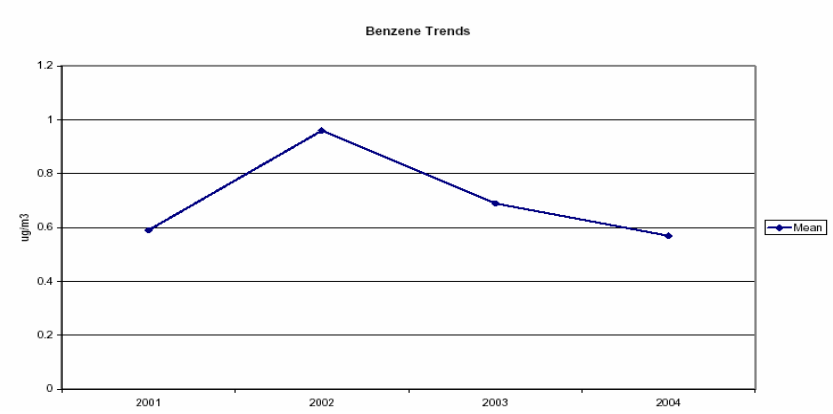

Figure Env1 – Benzene levels 2001 – 2004 (Cork City Laboratory, 2004)

The perception of Air Quality was measured for the Baseline condition by the CIVITAS questionnaire. 135 CIVITAS questionnaires were completed in 2002; Figure Env2 details the results of the Air Quality perception. The main drainage works being carried out in the city may have influenced the respondent's answers.

CITY-LEVEL RESULTS

Indicator Group: Environment	Project: MIRACLES
Evaluation Area: Cork City	City: Cork

The Indicator – what is it about?

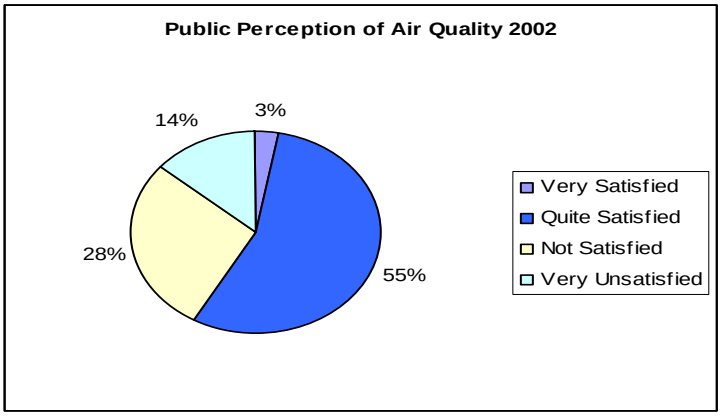

Figure Env2 - Baseline public perception of Cork City air quality, 2002.

The perception of Air Quality was again measured for the Ex-post Scenario by CIVITAS questionnaires. 135 CIVITAS questionnaires were completed in 2005; Figure Env3 details the results of the Air Quality perception in 2005.

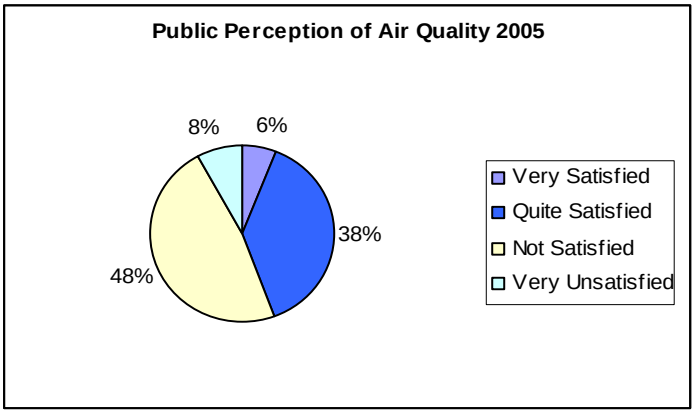

Figure Env3 - Ex-Post public perception of Cork City air quality, 2005.

As can be seen from Figure Env2 and Figure Env3, the satisfaction with air pollution has decreased from 2002 to 2005, with the number satisfied decreasing from 58% to 44%. However, the number of those very unsatisfied dropped from 14% to 8%. As part of WP5, emissions on the main street were measured and had dropped significantly on the Do-Nothing Scenario.

Additionally the effect on emissions were estimated for 5 of the 6 Cork Measures based on traffic volumes (see Measure Level Templates for details) - C5.1/Env1a, C7.3/Env1a, C10.1/Env1a, C10.2/Env1a, C12.2/Env1a.

Indicator 12 – Noise perception

Baseline noise measurements were carried out in the city centre during 2002 and again in 2005 as shown in Table Env3. It can be seen that noise levels have risen slightly since 2002 in three of the locations on St. Patrick's Street. The improvement to the perception of noise levels were also measured as part of the St. Patrick's Street user questionnaires in April 2005. Over 50% of people questioned stated that noise level were "much better" or "slightly better", despite noise level increasing slightly (3dBa, which is just noticeable).

CITY-LEVEL RESULTS

Indicator Group: Environment | **Project: MIRACLES**

Evaluation Area: Cork City | **City: Cork**

The Indicator – what is it about?

2002 Location	L Aeq (dBa)	L A10 (dBa)	L A50 (dBa)	L A90 (dBa)	*2005* Difference	L Aeq (dBa)	L A10 (dBa)	L A50 (dBa)	L A90 (dBa)
1	71	72	67	64		-1	0	0	-1
2	67	69	65	62		2	2	3	3
3	69	71	66	62		6	6	7	8
4	64	66		56		6	8		9

Table Env3 - Noise Levels on St. Patrick's Street and South Mall 2002 and increase in decibels 2005

The perception of noise acceptance was measured for the Baseline condition by the 2002 CIVITAS questionnaires, Figure Env4 details the results. The main drainage works being carried out in the city may have influenced the respondent's answers.

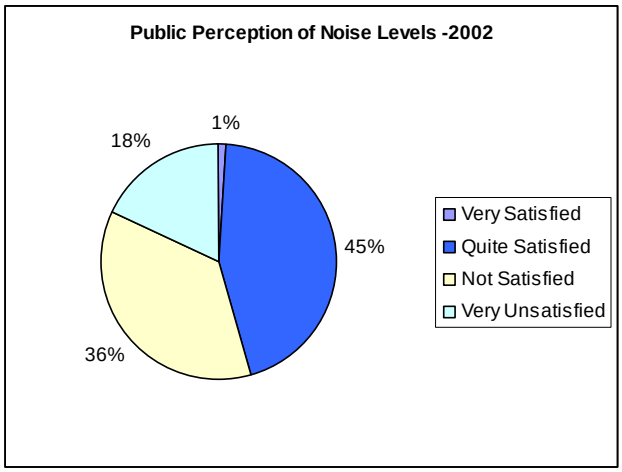

Figure Env4 - Baseline Cork City noise perception, 2002.

The perception of noise acceptance was again measured for the 2005 Ex-Post Scenario by CIVITAS questionnaires, Figure Env5 details the results.

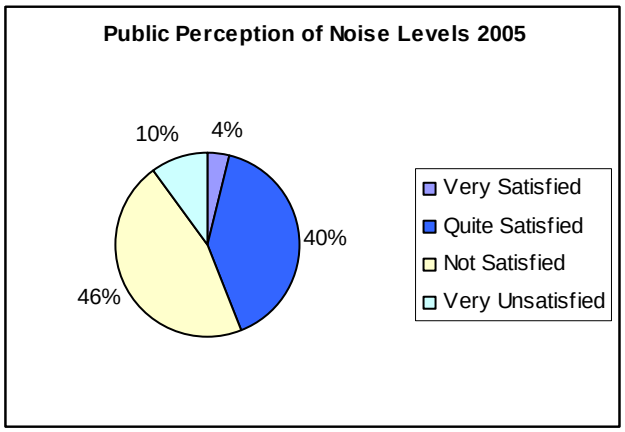

Figure Env5 – Ex -Post Cork City noise perception, 2005.

CITY-LEVEL RESULTS

Indicator Group: Environment	Project: MIRACLES
Evaluation Area: Cork City	City: Cork

The Indicator – what is it about?

As can be seen from Figures Env4 and Env5, the satisfaction with noise levels has decreased slightly from 2002 to 2005, with the number satisfied decreasing from 46% to 44%. However, the number of those very unsatisfied has dropped from 18% to 10%.

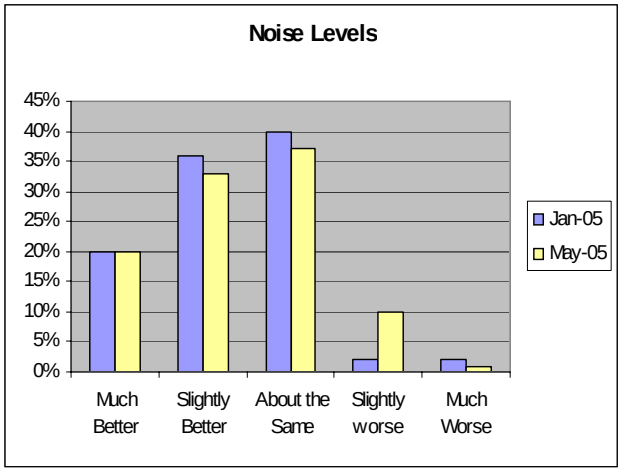

Figure Env6 – Ex -Post noise perception on St. Patrick's Street, 2005.

However it was found that the opinions on noise levels in St. Patrick's Street were much improved in 2005, due to the completion of the Main Drainage project, as can be seen in Figure Env6.

Additional Indicators

The change in the derelict area was examined at the Measure level for WP7.3 Blackash Park and Ride, details of which can be found in the Measure Level Template - C7.3/Env2a.

The overall opinion of the St. Patrick's Street redesign (seen in Figure Env7) and the opinion of visual improvement were very positive with over 60% rating it as "much better".

Figure Env7 - Baseline and Ex-Post Pictures of the Clean Zone Redesign.

Lessons Learned – what do other cities, other actors and the EC have to consider?

C7: Lessons learned:

The reduction in traffic levels due to the Clean Zone, the provision of the Park and Ride service, the increase in cycle facilities in the city centre and awareness raising activities of sustainable transport

CITY-LEVEL RESULTS	
Indicator Group: Environment	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

should all aid in the improvement of the environment. Traffic volumes on St. Patrick's Street have been reduced by a third on the Baseline volumes.

Air and noise pollution perception within the city centre improved due to the expansion of the Clean Zone, which should particularly benefit on-street traders and buskers and encourage people to relax, sit, talk or enjoy entertainment on the street. This should make the city centre safer and more attractive to pedestrians of all abilities, promoting inner city shopping and the tourist trade.

The Clean Zone also created extra city open spaces for hosting cultural events/recreational activities (e.g. a street fair was held on the new streetscape to mark the "Day of Welcomes" when Cork celebrated the expansion of the EU).

Contact Point

.www.corkcity.ie/services/depts/dept_road_miracles.html

✉ MIRACLES, Traffic Division, Cork City Council, City Hall. ☎ 021 4924457

11. City-level Results - Society

CITY-LEVEL RESULTS	
Indicator Group: Society	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

C1: Local objectives and quantifiable targets:

The local objectives with regard to society were:

- To increase citizen awareness of the need, potential and ability to change to more sustainable transport patterns.
- To encourage families to use public transport together, by offering a cheaper alternative to the regular public transport services on offer to families.
- To encourage people to abandon the car entirely.
- Raise awareness about sustainable transport modes through the provision of facilities, which highlight and cater for the needs of cyclists and pedestrians.

No quantifiable targets were set for this group of measures.

C2: Indicator description:

Indicator 13 – Public awareness of the MIRACLES/CIVITAS project - this indicator is the percentage of respondents who were aware of the project as well as awareness of the various MIRACLES measures.

Indicator 14 – Public acceptance of the MIRACLES measures- this indicator reports on the percentage of user and operator acceptance of the various measures.

Indicator 15 – Public transport accessibility was measured on a quantifiable level from the public transport company, by the percentage of low floor buses.

Indicator 16 – Public transport service relative cost, it was not possible to gather the information required for this indicator.

Indicator 17 – Perception of public transport security - this indicator reports the national perception of public transport security. On the measure level, it also reports the results of user security surveys and the recorded number of incidents.

C3: Context and relevance:

The indicators in the Society group demonstrate the impact of the MIRACLES project on society. This is a mainly a qualitative exercise and many surveys were carried out both at measure level and at city level to gauge the acceptance and opinions of the public on the project.

The Evaluation –what are the results?

C4: Method of measurement:

Indicator 13 – Awareness level and Indicator 14 – Acceptance level.

Public awareness and knowledge of the MIRACLES project and individual Measures were determined through the CIVITAS/MIRACLES questionnaires, which were conducted in 2002 and 2005. Acceptance of the individual Cork Measures was measured separately for each measure.

Indicator 15 – Perception of public transport accessibility.

The percentage of the Cork City and suburban bus fleet which consisted of low floor fully accessible vehicles was obtained for the Baseline Year, 2002 and for 2005.

CITY-LEVEL RESULTS

Indicator Group: Society	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

Indicator 16 – Public transport service relative cost.
This core indicator was not included since the collection of the personal available income/budget of public transport users was not considered necessary for the evaluation of the Cork Measures.

Indicator 17 – Perception of public transport security.
The perception of public transport security was obtained from the local bus company in 2002 and in 2005. Additional information was provided through surveys of people's perceptions relating to the individual MIRACLES measures.

C5: Achievement of quantifiable targets:

There were no quantifiable targets for the Society indicator group.

C6: Report on results:

Indicator 13 – Awareness level
Public awareness and knowledge of the MIRACLES project and individual Measures were determined through the CIVITAS/MIRACLES questionnaires.

135 CIVITAS questionnaires were completed for the Baseline 2002. 97% of respondents had not heard of the CIVITAS initiative. The 3% that had heard of the initiative did so through word of mouth. 96% of the people surveyed did not know that Cork was participating in CIVITAS/ MIRACLES.

135 CIVITAS questionnaires were completed for the 2005 Ex-Post surveys. 16% had heard of the CIVITAS initiative. 14% of those surveyed knew that Cork was participating in CIVITAS/ MIRACLES. These figures show an increase in awareness of the MIRACLES and CIVITAS projects in Cork.

Awareness of the individual Cork Measures was measured separately for each measure. The CIVITAS questionnaire gauged the awareness of the MIRACLES Measures; Park and Ride, Car Sharing, Restricted Car Access, Lower Emission Vehicles and Awareness measures. The results on awareness for the Baseline 2002 are shown in Figure Soc1 and for 2005 in Figure Soc2.

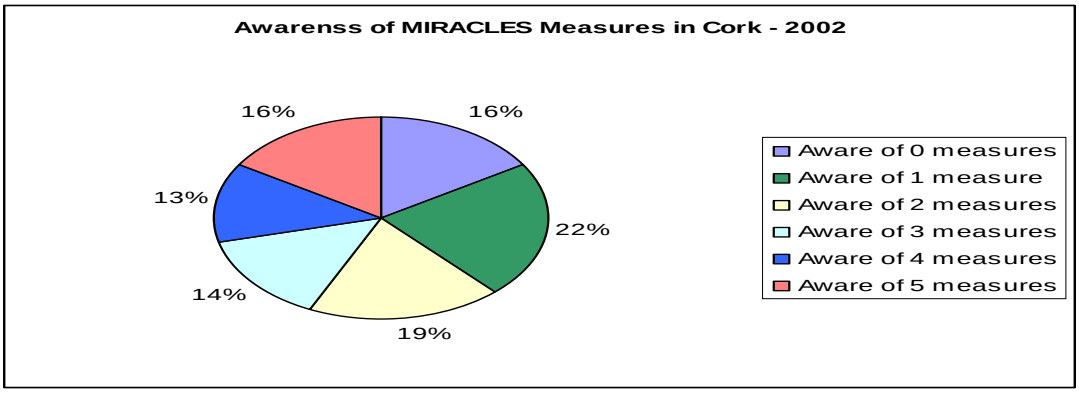

Figure Soc1 – Awareness of MIRACLES Measures in Cork (2002 CIVITAS survey results)

CITY-LEVEL RESULTS

Indicator Group: Society	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

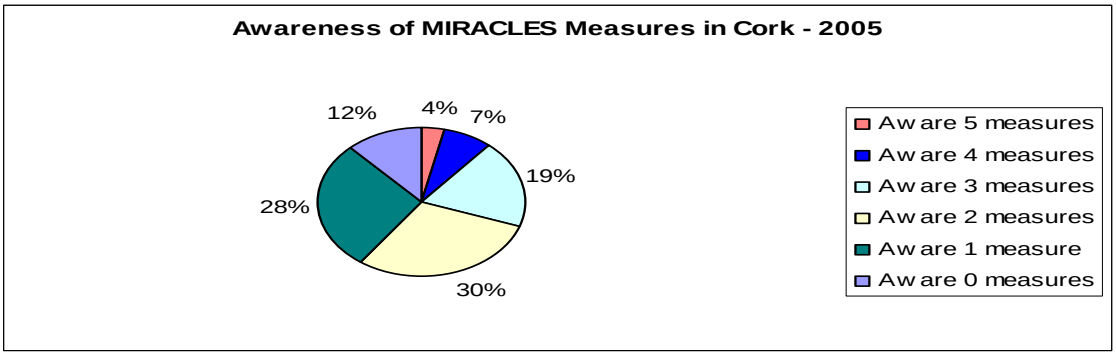

Figure Soc2 – Awareness of MIRACLES Measures in Cork (2005 CIVITAS survey results)

In the 2005 CIVITAS surveys it was found that the awareness levels had increased with the number of people aware of "no measures" decreasing to 11.9% in 2005. The awareness for one, two or three measures had also increased (28.2%, 29.6% and 19.3% respectively) with the largest increase being in the awareness of 2 measures (a 10.6% increase). However, the awareness of four or five measures had decreased to 3.7% and 7.4% respectively in 2005.

Awareness raising activities for sustainable modes of transport were carried out throughout the MIRACLES project. In particular through participation in the annual European Car Free day, during which the clean zone was closed to private vehicles, and during European Mobility Week through the promotion of the Blackash Park and Ride (free of charge for these occasions) and the new cycle parking facilities in the city centre.

The access restrictions on St. Patrick's Street have been complimented by better facilities for pedestrians and cyclists which should encourage people to reappraise their travel arrangements. The Park and Ride scheme has been particularly useful for people wishing to access the clean zone for work or recreation, particularly for events such as the official opening of different phases of the street works and other events which closed off the clean zone to cars; such as the Awakening Ceremony to inaugurate Cork's Reign as European Capital of Culture in 2005 when park and ride operating hours were extended to accommodate the peak demand on the day.

The redesign of Patrick's Street, created extra space for hosting cultural events/recreational activities (e.g. a street fair was held on the new streetscape to mark the "Day of Welcomes" when Cork celebrated the expansion of the EU).

Indicator 14 – Acceptance level

Acceptance of the individual Cork Measures was measured separately for each measure. The user and operator acceptance level of each measure was gauged by means of questionnaire/discussion for each of the six Cork Measures, details of these indicators can be found in the Measure Level Templates.

- Operator acceptance rating - C5.1/Accp1a, C7.3/Accp1a, C10.1/Accp1a, C10.2/Accp1a, C11.2/Accp1a, C12.2/Accp1a
- User acceptance rating - C5.1/Accp2a, C7.3/Accp2a, C10.1/Accp2a, C10.2/Accp2a, C11.2/Accp2a, C12.2/Accp2a.
- Ease of use rating - C10.1/Accp3a, C10.2/Accp3a, C11.2/Accp3a.
- Comfort rating - C10.2/Accp4a
- Cityscape visual improvement - C5.1/Env3a

Acceptance of the MIRACLES project at the city level was positive with the Measures being in general a success.

CITY-LEVEL RESULTS

Indicator Group: Society	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

Indicator 15 – Perception of public transport accessibility.
In 2002, 82% of the Cork City and suburban bus fleet consisted of low floor fully accessible vehicles. No further Baseline information was available. In 2005, 90% of the Cork City and suburban bus fleet consisted of fully accessible vehicles.

While none of the MIRACLES measures directly impacted on the existing public transport services, the redesign of St. Patrick's Street (an important public transport departure/ termini point for many routes) brought about an improvement in the public transport facilities (e.g. bus shelters, timetables, etc.). The addition of the Blackash Park and Ride service also encouraged people to use public transport facilities; the Park and Ride buses are also fully accessible.

Indicator 16 – Public transport service relative cost.
This core indicator was not included as the collection of the personal available income/budget of public transport users was not viable.

Indicator 17 – Perception of public transport security.
The perception of public transport security in 2002 was good as they were very few incidents in relation to the approximate 11 million passenger journeys in 2002. This was also the case in 2005 with again very few reported incidents in relation to the approximate 12.5 million passenger journeys in 2004.

Additional information was provided through surveys of perceptions relating to the individual MIRACLES measures, details of these indicators can be found in the Measure Level Templates.

- Safety rating - C7.3/Saf2a, C10.2/Saf1a
- Incident levels - C7.3/Saf2b

Lessons Learned – what do other cities, other actors and the EC have to consider?

C7: Lessons learned:

Raising awareness of sustainable transport modes was achieved through the implementation of a number of MIRACLES Measures.

Advertising and a prolonged media campaign for many measures (particularly Park and Ride) along with the integration of MIRACLES with existing sustainable transport promoting activities (European Car Free day and Mobility Week) further increased the awareness and acceptance of the various MIRACLES measures.

Diverse methods were employed to promote sustainable transport options including cycle safety training, advertisements, competitions, free days website promotion etc. It was found that a mix of methods is best at reaching a range of different audiences.

There also seemed to be a more favourable attitude amongst Cork City Council employees to sustainable transport post MIRACLES. This was inferred from annual travel to work surveys which were intended to stimulate discussion of sustainable transport modes as well as to monitor changes in mode of commuting. The gradual shift towards sustainable modes is best illustrated by the reduction in private car use from 40.95% in 2002 to 34.8% in 2005 and the increase in numbers walking from 13.36% to 23.87% over the same period. Many employees moved closer to the city centre to reduce commuting times, others were motivated by the reduction in available staff parking.

More than expected, wherever new technology was introduced training and regular consultation with operators was required both pre and during implementation.

User feedback from measures, questionnaire surveys, helpful in identifying problem areas to be

CITY-LEVEL RESULTS	
Indicator Group: Society **Evaluation Area: Cork City**	**Project: MIRACLES** **City: Cork**
The Indicator – what is it about?	
ameliorated as well as aspects of the measure that are working well. A continual liaison with disability groups during the design and implementation of new traffic management measures is necessary.	
Contact Point .www.corkcity.ie/services/depts/dept_road_miracles.html ✉ MIRACLES, Traffic Division, Cork City Council, City Hall. ☎ 021 4924457	

12. City-level Results - Transport

CITY-LEVEL RESULTS	
Indicator Group: Transport	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

C1: Local objectives and quantifiable targets:

The local objectives were to:

- Redirect motor traffic away from the city centre and onto the ring roads or into the park and ride centre.
- Reduce the volume of motor traffic coming into the city from the southeast and lessen the demands on inner city parking. To integrate the new ring road system with public transport into the city.
- Provide secure places for cycles to be locked, in locations that provide the most benefit for cyclists and nearby residents/businesses.
- Demonstrate methods for reducing peak-hour traffic congestion, such as carpooling.
- To aid in reducing the inner city traffic congestion caused by motorists searching for a parking space.

The local quantifiable targets were to:

- Reduce lane capacity by 50% on the city's main arterial route from 4 lanes to 2 lanes, which cuts through the heart of the primary shopping district.
- Increase the numbers of cycle parking facilities within the city centre by at least 40% and increase in the numbers of cyclists in the city centre by 10%.
- Reduce traffic levels through the access-restricted zone by at least 2%, as compared with the Do-Nothing scenario.
- Provide at least 450 Park and Ride spaces at a new facility at Blackash; maintain uptake of Park and Ride to near full capacity.
- Reduce the number of car trips incurred by employees of Cork City Council. Achieve a 5% decrease in the use of the private car among employees of Cork City Council (42% solo car users in 2002).

C2: Indicator description:

Indicator 18 – Accuracy of public transport timekeeping.
This indicator accounts for the reliability of arrival times of public transport services.

Indicator 19 – Quality of public transport service
This indicator measures the general user perception of the overall quality of public transport services.

Indicator 20 – Number of injuries and deaths caused by accidents in the city centre.
This indicator is a measure of the number of fatalities and injuries caused by city traffic accidents by any means of transport.

Indicator 21-22 – Vkm by vehicle type peak and off peak.
This indicator measures the total trip length by vehicles.

Indicator 23-24 – Average vehicle speed peak and off peak.
The level of congestion is measured by the average speed.

Indicator 25 – Total number of goods vehicles moving in demonstration area.
This indicator measures the number of freight vehicles moving in the city centre.

Indicator 26 – Average modal split-PAX; Indicator 27 – Average modal split-vehicles.

CITY-LEVEL RESULTS

Indicator Group: Transport	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

This indicator measures the percentage of people carried by each transport mode in the city centre.
Indicator 28 – Average occupancy.
This indicator measures the average occupancy (number of passengers) per vehicle.

Additional indicators were used to monitor the impact of the MIRACLES projects on transport: Park and Ride Patronage (pax/day) - C7.3/Tran2c, Pedestrian volume levels (Number) - C5.1/Tran7a, Use of cycle parking facilities (%) - C5.1/Tran8b, C10.1/Tran3b, Classified traffic volumes (Peak and AADT Volumes) - C5.1/Tran3a, Number of lanes (Number) - C5.1/Tran4a, Parking spaces (Number) - C5.1/Tran4b, C7.3/Tran2b, C10.1/Tran2a.

C3: Context and relevance:

The transport indicator group examines the impacts the MIRACLES measures have on Cork city centre. They provide information on modal splits, accidents and various other transport indicators to enable the quantification of the impacts of the six MIRACLES measures in Cork. The combination of these six measures aims to promote sustainable transport in Cork and reduce the traffic volumes and congestion in the city centre.

The Evaluation –what are the results?

C4: Method of measurement:

Indicator 18 – Accuracy of public transport timekeeping.
Surveys were carried out as part of the Green Routes Project (Quality Bus Corridors) which examined the journey times of public transport routes; these results will be available in March 2006.

Indicator 19 – Quality of public transport service.
Public user perceptions regarding public transport in the city centre were measured on a national basis by the bus transport company in 2002 and 2004.

Indicator 20 – Number of injuries and deaths caused by accidents.
This indicator was established by the number of accidents occurring in Cork City according to Road Accident Facts in Ireland 2002 (NRA, 2002). This report was also obtained for 2003 and 2004. The 2005 report has yet to be published. In addition safety perceptions and accident numbers are examined at the measure level.

Indicator 21-22 – Vkm by vehicle type peak and off peak.
Daily trip lengths were not included as resources were not available for the collection of daily total trip lengths by vehicle type in peak and off-peak hours at a frequency of one week per quarter. Average distance from home to work, school and college are provided from Census data for Cork City produced by the Central Statistics Office. The next Census will take place in 2006 and results will be available in 2007.

Indicator 23-24 – Average vehicle speed peak and off peak.
Journey times are identified from surveys on St. Patrick's Street and the South City Link Road (N27) carried out during 2002, these surveys also provide information on average speed, etc. It was not possible to measure average speeds in the manner set out in the Draft Methodology Sheets due to the road works taking place in 2002.

Additionally further cross-city journey time information can be found from the Cork Strategic Plan Report which details journeys times in 2000. Average journey times from home to work, school and college are provided from Census data for Cork City produced from the Central Statistics Office in

CITY-LEVEL RESULTS

Indicator Group: Transport	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

2002. The next Census will take place in 2006 and results will be available in 2007. The Cork Green Routes study counts provides bus journey times for Cork City in 2002 and 2006.

Indicator 25 – Total number of goods vehicles moving in demonstration area.
Freight movements, were not included as the collection of the freight information at a frequency of one week per quarter was not viable.

Indicator 26 – Average modal split-PAX, and Indicator 27 – Average modal split-vehicles.
Census data produced by the nationally by the Central statistics office (CSO) was used to obtain modal split data for the Baseline 2002. The next Census will take place in 2006 and results will be available in 2007.

Indicator 28 – Average occupancy.
Bus patronage figures were established from the local bus company. Surveys to determine the information at the frequency of all week days spread over four quarters till the end of the project was not viable. The average daily patronage the each of the city bus routes was identified by Bus Eireann in 2003.

Additional indicators:
Park and Ride patronage (pax/day) - C7.3/Tran2c,
Pedestrian volume levels (Number) - C5.1/Tran7a,
Use of cycle parking facilities (%) - C5.1/Tran8b, C10.1/Tran3b,
Classified traffic volumes (Peak and AADT Volumes) - C5.1/Tran3a,
Number of lanes (Number) - C5.1/Tran4a,
Parking spaces (Number) - C5.1/Tran4b, C7.3/Tran2b, C10.1/Tran2a.

C5: Achievement of quantifiable targets:

The following quantifiable targets were achieved as part of the MIRACLES project:

- Lane capacity was reduced by 50% on the city's main arterial route from 4 lanes to 2 lanes.
- The objective was to reduce traffic levels through the access-restricted zone by at least 2%, as compared with the Do-Nothing scenario. A historic growth rate of 3.5% per annum was used (LUTS predictions and the Cork Strategic Plan) to form the Do-Nothing Scenario. The actual reduction in the overall level of car traffic through the inner cordon was 3.3% on the Do-Nothing Scenario; this was identified from traffic volume counts carried out in December 2005.
- The objective was to increase the number of cycle parking facilities within the city centre by at least 40%. The actual increase of cycling parking facilities achieved was closer to 4000% in the city centre. Over 300 cycle spaces are expected to be in place by the completion of the MIRACLES project, compared with only 8 cycle stands identified in the Baseline survey.
- The target increase in the numbers of cyclists was at least 10%. The actual increase was identified from LUTS classified traffic counts in October 2005, which identified a 47% increase in cycling across the inner cordon.
- It was originally planned to provide at least 450 Park and Ride spaces at a new facility at Blackash, over 900 Park and Ride spaces have been provided.By November 2005 Blackash Park and Ride had on average 500 users/day.
- The target of a 5% decrease in private car use amongst employees of Cork City Council was achieved (42% solo car users in 2002). The MIRACLES car pooling project may have been a catalyst for the change in modal split. However it is likely that reduced parking availability

CITY-LEVEL RESULTS

Indicator Group: Transport	Project: MIRACLES
Evaluation Area: Cork City	City: Cork

The Indicator – what is it about?

contributed significantly.

C6: Report on results:

Severe congestion, particularly in the South and West of the City, contributes to timekeeping difficulties, especially at peak times for public transport services. The Green Routes project (part of the Do-Something Scenario) was specifically designed to overcome this problem. The MIRACLES measures have had relatively little effect on this indicator. The redesign of Patrick's Street, where many public transport services depart/arrive, was of benefit with increased waiting space for public transport services as well as attractive newly designed bus shelters. The new Park and Ride service was additional to the current city services and has a very good timekeeping record (see Measure Level Template WP7.3 for details – measure level indicators recorded were: Average headway (C7.3/Tran6a), Variability of arrival times (C7.3/Tran7a) and Variability of journey times (C7.3/Tran7b). The introduction of the Green Routes and the completion of Cork Main Drainage work and the renovation of St. Patrick Street have greatly improved the ability of buses to maintain peak hour bus schedules according to the local public transport company. The results of these improvements will not be known until the results of the post Green Route introduction surveys available in March 2006.

Indicator 19 – Quality of public transport service.
Public user perceptions regarding public transport are measured on a national basis by the local public transport company as part of their market research. This research indicated that there was a 91% satisfaction rating with the public transport services in 2002. A similar study was carried out at the end of 2004. This indicated that there was no change in the satisfaction rating.

Additionally, at the Measure level, the April 2005 user survey of the Blackash Park and Ride service (WP7.3) rated the quality of the Park and Ride service as 82% 'Very Good' and the remaining 18% rating it as 'Good' or 'Satisfactory'.

Indicator 20 – Number of injuries and deaths caused by accidents.
This indicator was established by the number of accidents occurring in Cork City according to Road Accident Facts in Ireland 2002 (NRA, 2002). Table Tran1 shows the fatal and injury accidents occurring in Cork City in 2002. Table Tran 2 and 2b shows the 2003 and 2004 data. The number of fatal accidents decreased slightly (however the numbers are too low to identify any trend) and the injury accidents decreased by 30% from 2002.

	Fatal	Injury
Pedestrians	2	76
Pedal Cycle Users	0	9
Motor Cycle Users	0	76
Car Users	1	168
Goods Users	0	7
Other/Unknown	2	4
Total	**5**	**340**

Table Tran1 Fatal and Injury accident for Cork City 2002, Road Accident Facts-NRA.

CITY-LEVEL RESULTS

Indicator Group: Transport	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

	Fatal	Injury
Pedestrians	1	62
Pedal Cycle Users	0	2
Motor Cycle Users	2	60
Car Users	0	141
PSV Users	0	3
Goods Users	0	11
Other/Unknown	1	4
Total	**4**	**283**

Table Tran2 Fatal and Injury accident for Cork City 2003, Road Collision Facts-NRA.

	FATAL	INJURY
Pedestrians	0	65
Pedal Cycle Users	0	10
Motor Cycle Users	1	43
Car Users	2	112
PSV Users	0	0
Goods Users	0	5
Other/Unknown	0	2
Total	***3***	***237***

Table Tran2b Fatal and Injury accidents for Cork City 2004, Road Collision Facts (NRA 2004)

In addition, safety perceptions and accident numbers are examined at the Measure level. Accidents occurring on St. Patrick's Street and on the South City Link Road were examined (C5.1/Saf1a, C7.3/Saf1a), as well as the number of accidents occurring on converted lower emission vehicles in WP12.2 (C12.2/Saf1a).

The reported crime figures for St. Patrick's Street from 2002 to 2004 were examined. These showed that reported personal assaults were down by 33%.

The redesign of the St. Patrick's Street and the expansion of the Clean Zone are considered to have created a safer environment for vulnerable road users and pedestrians. The reduction in traffic levels due to WP5.1 and WP7.3 should also have contributed to lower accident levels.

Indicator 21-22 – Vkm by vehicle type peak and off peak.
Daily trip length, was not included as the collection of daily total trip lengths by vehicle type in peak and off-peak hours at a frequency of one week per quarter was not viable. Average distance from home to work, school and college are provided from Census data for Cork City (Central Statistics Office, 2002). The results are shown in Table Tran3. The next Census will be conducted in 2006 with results available in 2007.

CITY-LEVEL RESULTS

Indicator Group: Transport	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

Distance Travelled	%
0 miles	2.2
1 mile	34.9
2 miles	19.6
3 to 4 miles	20.9
5 to 9 miles	13.5
10 to 14 miles	4.2
15 to 29 miles	3.4
30+ miles	1.2
Total Trips	**64371**

Table Tran3 Distance travelled from home to work, school or college for Cork City 2002

Indicator 23-24 – Average vehicle speed peak and off peak

Journey times are identified from surveys carried out during 2002 and 2005, these surveys also provide information on average speed, etc. It was not be viable to measure average speeds in the manner set out in the METEOR Draft Methodology Sheets due to the road works taking place in 2002.

An average 'morning peak' vehicle speed of 14 km/h on St. Patrick's Street was calculated from the journey times experienced over the entire length of the route, which included delays experienced due to queues at pedestrian crossings/signalised junctions, as detailed in Section 2.3.5.2. The average off-peak journey time was observed to be 20-25 km/h. The 2005 surveys showed that the average 'morning peak' vehicle speed had decreased to 9.6km/h on St. Patrick's Street, while average off-peak journey time remained at 20-25 km/h.

Additionally further cross-city journey time information can be found from the Cork Strategic Plan Report which details journeys times in 2000, as seen below in Table Tran4. A similar study was carried out as part of the Green Routes project, results of which will be available in March 2006.

CITY-LEVEL RESULTS

Indicator Group: Transport	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

JT Run	Route	Direction	Avg Obs Time	Min Obs Time	Max Obs Time
1	Blackpool	to city	32.2	18.50	45.50
		from city	13.23	9.52	16.53
		full route	45.43	28.42	1.02.43
2	South City Link	to city	9.06	4.34	13.16
		from city	4.07	2.57	5.33
		full route	13.13	7.31	18.49
3	Bishopstown-Mayfield	to city	20.04	11.29	27.45
		from city	15.18	13.11	17.25
		full route	35.22	24.40	45.10
4	Mayfield-Bishopstown	to city	27.23	21.30	33.16
		from city	15.14	13.36	16.52
		full route	42.37	35.06	50.08
5	Douglas Road	to city	16.35	7.48	25.50
		from city	9.10	5.05	14.12
		full route	25.45	12.53	40.02
6	Sunday's Well Road	to city	8.06	4.51	11.36
		from city	8.54	4.32	15.17
		full route	17.00	9.23	26.53
7	Tivoli/Horgan's Quay	to city	17.03	8.03	31.00
		from city	5.03	2.09	2.47
		full route	22.07	10.12	33.47
8	Model Farm Road	to city	15.56	6.48	17.47
		from city	10.43	6.28	13.41
		full route	26.39	13.16	31.28

Table Tran4 Journey time surveys along 8 bus routes (WS Atkins, 2000, Cork Strategic Plan)

Average journey times from home to work, school and college are provided from Census data for Cork City produced from the Central Statistics Office in 2002. The results are shown in Table Tran5. The Census will be carried out again in 2006 with information available in 2007.

CITY-LEVEL RESULTS

Indicator Group: Transport	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

Journey Time	**%**
< 15 minutes	44.5
15 to 30 minutes	37.1
30 to 45 minutes	13.5
45 to 60 minutes	3.1
60 to 90 minutes	1.3
> 90 minutes	0.5
Total Trips	**72297**

Table Tran5 Journey Time of travel from home to work, school or college for Cork City 2002

Additionally journey times were examined at the Measure level (C5.1/Tran1a, C7.3/Tran1a, C10.2/Tran1a).

Indicator 25 – Total number of goods vehicles moving in demonstration area.
Freight movements, were not included as the collection of the freight information at a frequency of one week per quarter was not viable.

Indicator 26 – Average modal split-PAX and Indicator 27 – Average modal split-vehicles.
Census data produced nationally by the Central Statistics Office (CSO) were used to obtain modal split data for the Baseline 2002. The results for 2006 are due to be published in 2007. The modal split is based on city wide data and the city centre measure is likely to have only a minimal effect on the overall modal split of the city. Table Tran6 below shows the 2002 modal split for Cork City.

Mode	**%**
Walk	34.0
Bicycle	2.3
Bus	10.0
Rail	0.2
Motorcycle	1.2
Car driver	34.5
Car passenger	17.8
Total Trips	**70048**

Table Tran6 Modal Split of travel from home to work, school or college for Cork City, Census 2002

The Cork LUTS study counts provide a classified inner cordon volume of traffic for Cork City in 2002 of 105180. This count was repeated in November 2005 and was 113744. The modal split is considered in the Measure Level Templates (Average modal split (% by mode) {26 -27} - C5.1/Tran5a, C7.3/Tran4a, C10.1/Tran1a, C10.2/Tran2a).

While the impact on the modal split cannot be identified until the next Census, it is hoped that the provision of the Park and Ride service, increased cycling facilities and promotion of sustainable transport will all aid in the change towards more sustainable modes.

Indicator 28 – Average occupancy.
Bus patronage figures were established from the local bus company. Surveys to determine the information at the required frequency of all week days spread over four quarters till the end of the project was not viable. The average patronage of the city bus routes is shown in Table Tran7.

CITY-LEVEL RESULTS

Indicator Group: Transport	**Project: MIRACLES**
Evaluation Area: Cork City	**City: Cork**

The Indicator – what is it about?

Route No.	1991	1992	1993	1994	1995	1996	1997	1998	1999	2001	2002	2003	2004
Total	9,261	9,014	9,344	9,351	9,048	8,889	8,756	8,616	8,647	9,836	10,260	10,263	10,142

Table Tran7 - Annual patronage in Cork City (Bus Eireann, 2004)

The only available city wide information on vehicle occupancy was that for the Park and Ride facility. This was found to be very low with over 90% of people surveyed being drivers.

Additional indicators

- The **patronage of the Park and Ride** site in November 2005 varied from 370 to 800 vehicles a day averaging at approximately 450 vehicles per day for the whole month.
- An increase in the **number of pedestrians** in the city centre was expected, and the Ex-Post surveys carried out in May 2005 shown that the figures increased substantially. In May 2005, the evening peak was 5,430 pedestrians per hour, two-way count, (a 53% increase on December 2002).
- The number of cycles parked in the city centre increased dramatically since the Baseline 2002 survey. There were 105 parked cycles in the city centre in the September 2005 surveys. The **usage of the cycle facilities** is increasing, approximately 30% with a similar number parked elsewhere.
- **Classified traffic volumes** on St. Patrick's Street in Winter 2005/ Spring 2006 showed that traffic volumes on the street had declined by approximately a third on the 2002 levels.
- The **number of lanes** on St. Patrick's Street was reduced from 4 to 2, achieving the 50% reduction in lane capacity.
- The **number of parking spaces** was monitored for the Clean Zone, the Park and Ride and the number of cycle stands put in place. No parking places were provided in the St. Patrick's Street redesign as the space was used for loading bays and taxi ranks. Approximately 900 Park and Ride spaces were made available at Blackash. In November 2005, MIRACLES support provided parking for up to 264 cycles; by the end of the project 316 cycle spaces will be provided.
- **The Park by Phone** parking management/parking payment scheme accessed by mobile phone was not introduced until September 2005. Usage of the system in February 2006 was 100 parking instances per day.

Lessons Learned – what do other cities, other actors and the EC have to consider?

C7: Lessons learned:

It is difficult to quantify the effect of the MIRACLES Measure on Cork City as these were implemented in parallel with major projects, such as the Green Routes (Quality Bus Corridors) and the City of Culture 2005. However, the six Cork MIRACLES Measures definitely influenced the transport changes which occurred in Cork City.

The difficulties in getting people to change mode was especially apparent in WP10.2 (car pooling), Parking restrictions were thought to be generally more effective than efforts to promote the health and environmental benefits of switching to be more sustainable modes. That said a number of individuals did start to walk or cycle more to work for health benefits. In general the attribute most valued by commuters is "convenience". Measures which make sustainable transport modes more convenient and reliable than private car use seem to be most effective.

CITY-LEVEL RESULTS	
Indicator Group: Transport **Evaluation Area: Cork City**	**Project: MIRACLES** **City: Cork**
The Indicator – what is it about?	
Contact Point 💻.www.corkcity.ie/services/depts/dept_road_miracles.html ✉ MIRACLES, Traffic Division, Cork City Council, City Hall. ☎ 021 4924457	