



D.5

Evaluation Report

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Evaluation Report

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List of Abbreviations used throughout the document:

<i>Evaluation Plan: EP</i>	<i>ACS – Access Control System</i>
<i>Local Evaluation Plan: LEP</i>	<i>ANPR - Automatic Number Plate Recognition</i>
<i>Evaluation Manager: EM</i>	<i>CNG – Compressed Natural Gas</i>
<i>Local Evaluation Manager: LEM</i>	<i>CO – Carbon Monoxide</i>
<i>Measure Leader: ML</i>	<i>DLG – Dissemination Liaison Group</i>
<i>Site Coordinator: SC</i>	<i>DoW – Description of Work</i>
<i>Municipality of Genoa: CDG</i>	<i>EC – European Commission</i>
<i>Azienda Mobilità e Trasporti S.p.A: AMI</i>	<i>EURO I, II, III, IV – European emission standards</i>
<i>Softeco Sismat SpA: Softeco</i>	<i>HC – Hydrocarbons</i>
<i>Azienda Mobilità e Trasporti S.p.A: AMT</i>	<i>HWTP – Home Work Trip Plan</i>
<i>D'Appolonia SpA: DAPP</i>	<i>ICS – Iniziativa Car Sharing</i>
<i>Istituto Internazionale Delle Comunicazioni: IIC</i>	<i>LEV – Low Emission Vehicle</i>
<i>University of Genoa - Department of Economics and Quantitative Methods: DIEM</i>	<i>LTZ – Limited Traffic Zone</i>
<i>Agenzia Regionale per la Protezione dell' Ambiente Ligure - Environmental protection Agency of the Regione Liguria: ARPAL</i>	<i>NOx – Nitrogen Dioxide</i>
<i>Agenzia Regionale per l'Energia della Liguria SpA: ARE</i>	<i>PM10 - Particulate Matter – fraction below 10 micron</i>
<i>QN Financial Services Spa: QN</i>	<i>PT – Public Transport</i>
<i>Municipality of Krakow: UMK</i>	<i>RP – Road Pricing</i>
<i>Miejskie Przedsiębiorstwo Komunikacyjne SA w Krakowie: MPK</i>	<i>ZEV – Zero Emission Vehicle</i>
<i>Politechnika Krakowska im. Tadeusza Kosciuszki: PK</i>	
<i>Forms Group: FORMS</i>	
<i>Rupprecht Consult Forschung & Beratung GmbH: RC</i>	
<i>Municipality of Burgos: AYTObU</i>	
<i>Strategic Bureau of Burgos: APEBU</i>	
<i>Castilla-Leon Institute of Technology: ITCL</i>	
<i>Municipality of Stuttgart: LHS</i>	
<i>SSP Consult Beratende Ingenieure GmbH: SSP</i>	
<i>University of Stuttgart: VuV</i>	
<i>Verband Region Stuttgart: VRS</i>	

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- New forms of vehicle use/ownership and alternative transport modes
- Improvement of PT
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- Mobility plans and traffic management

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1. CARAVEL MOBILITY POLICIES: STRATEGIES...

The urban mobility policies mainly deal with three different categories or fields of action: the circulation of private vehicles, the public transport service and the infrastructures.

The circulation policies are essentially short-medium term policies and are prevalingly of regulating nature. The public transport policies require a direct intervention in its production, while the infrastructural policies are long term ones and usually need the intervention of a public subject. Caravel project has promoted policies dealing with the first two categories, the circulation of private vehicles and the public transport service. Given the limited temporal essence of the project no infrastructural policies have been developed.

It is worth saying that transport goals can be achieved with non transport tools; in the long period, for example, through urban and territorial planning that define the typology and intensity of the use of urban territory. In the short period, through the differentiation of timetables or through the activation of telematic services that allow the substitution of traditional transport with information displacement.

Regarding the nature of the interventions, we can distinguish between price policies (tariffs for stops, tariffs for public transport, etc), institutional-regulating (prohibition or restriction in the circulation, regulation of the public transport offer, etc) and technological (use of energy or less polluting vehicles).

It seems useful to categorize the mobility policies on the basis of the pursued strategies instead of the the field or nature of the interventions. The strategies can be of three different types.

The first one allows to minimize the demand for mobility at parity of accessibility. It includes all the measures dealing with containing the number/duration of the displacements of people and goods or its reorganization aiming at attenuating the space-time concentrations that are source of congestion.

The second strategy, in relation with the level of mobility that derives from the first one, tries to minimize the number of vehicle-trips with which it is produced. It mainly implies actions for a) the transfer of individual mobility towards collective mobility, reducing by this the average costs (direct and external) for each unit of mobility thanks to the reduction of the number of trips; b) an increase in the load coefficient of vehicles (mainly, but not only, in collective transport); c) a promotion of intermodality and integration among different modes or vehicles in the same trip (between different collective transports, but also between collective and individual means), so as to use for every segment of the trip the most efficient means of transport on the basis of the traffic load. The third strategy consists in minimizing, at parity of mobility or circulation of vehicles, results of the first two strategies, the polluting emissions of these vehicles, reducing also the average external costs per mobility unit of private or collective transport, through technical innovations, or transferring traffic from road to rail and/or from traction with thermal engines to less polluting sources of energy (like electric, etc)

It has to be taken into account that in countries where the public intervention has reached a very high level, another strategy consists on bringing the sector back to the efficiency of a competitive market.

2..... AND ACTIONS

Within the caravel project the actions ascribable to the different strategies already described, can be put under the following five themes:

- Demand management: access control strategies and rationalisation of freight distribution
- New forms of vehicle use/ownership and alternative transport modes
- Improvement of PT
- Sustainable mobility marketing
- Mobility plans and traffic management

The actions of the first group “Demand management: access control strategies and rationalization of freight distribution include:

- the rationalisation of goods distribution through an increase in the load coefficients and the reduction of the displacement of empty vehicles;
- the favoring of the integration between operators in the sector of the transportation of goods;
- the limitation of circulation and stop of private vehicles with tariffs and prohibitions (of absolute nature of by time bands), pedestrian zones, with limited traffic or stop.

The actions ascribable to the second groups “New forms of vehicle use/ownership and alternative transport modes” include:

- the stimulation of private collective transport (on behalf of companies for their employees, for example) and the increase of the occupation and use rate of the individual vehicles thanks to the contemporary (car pooling, collective taxi) or sequential (car sharing) use of more users;
- the reduction of the contaminating emissions of individual vehicles through policies that sustain and promote the use of different means.

The actions ascribable to the third group “Improvement of PT” comprise:

- an increase in the speed of collective public transport, even physically protected and with adequate technical innovations;
- the promotion of the tariff integration between different collective public means (sub-regional railroads, subways, bus lines, etc.) in order to avoid an inefficient duplication of the offer;
- the reduction of the contaminating emissions of the collective vehicles through regulations and incentives for the use of alternative means.

The actions ascribable to the fourth group “Sustainable mobility marketing” include:

- the creation of informative points and forums of communication dealing with the sustainable mobility topic.

The actions ascribable to the fifth group “Mobility plans and traffic management” comprise:

- the elaboration and implementation of specific mobility plans;
- the use of telecommunications and telematics to shorten and optimize the displacements and trips (information on the transport systems).

3. THE EVALUATION OF CARAVEL MOBILITY ACTIONS: THE IMPACTS

As shown in Table 1, the evaluation of the impacts allows the confrontation between the actions undertaken and the pursued strategic goals.

The measurement of the impacts can be associated to the following categories: economy, environment, energy, society and transport.

	IMPACT	STRATEGIC GOALS			
		TO REDUCE THE NUMBER OF VEHICLES MOVING AND PARKING	TO REDUCE POLLUTION	TO REDUCE THE DIRECT INTERVENTION OF PUBLIC BODIES	TO CREATE A MOBILITY CULTURE/TO INVOLVE STAKEHOLDER
ACTIONS	DEMAND MANAGEMENT	Transport indicators	Environment Energy indicators	Economy indicators	Society indicators
	NEW FORMS & ALTERNATIVE MODES	Transport indicators	Environment Energy indicators	Economy indicators	Society indicators
	IMPROVEMENT OF PT	Transport indicators	Environment Energy indicators	Economy indicators	Society indicators
	SUSTAINABLE MOBILITY MARKETING	/	/	/	Society indicators
	TRAFFIC MANAGEMENT	Transport indicators	Environment Energy indicators	Economy indicators	Society indicators

Tab. 1: Strategies, actions and impacts.

Society

Urban transport planning is becoming more and more complex. It concerns anybody who lives, works and moves in a city. It is therefore evident and becoming a commonly accepted approach to involve all stakeholders into the development and implementation process. The impact indicators aim is to discuss here how the cities involved in Caravel project have dealt with the stakeholders (consideration of their opinions, positions and requests), how the population and the businesses have been informed about the activities planned (e.g. timely constraints, mid-term and long-term benefits), how the awareness level regarding the urban mobility challenges has been raised, etc.

The objective of many measures is among others a behaviour change towards a more sustainable urban mobility. It is therefore important to discuss to which degree the people have actually changed their behaviour and accepted alternative transport modes, new services in public transport and/or different freight distribution models.

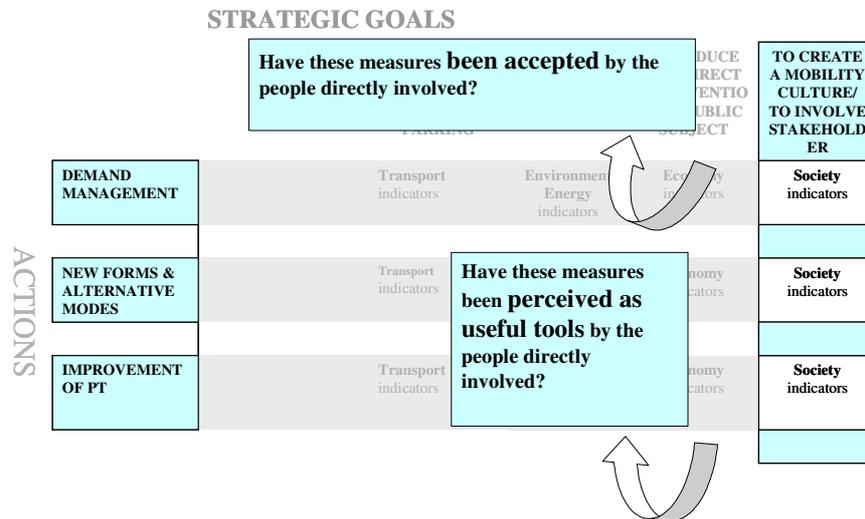


Table 2: Society: questions for evaluation

Economy

In evaluations within CiViTAS, and CARAVEL is no exception, economic aspects are chronically underrepresented. The most commonly stated reasons for this being the unavailability and the “sensitivity” of cost data. Furthermore, there is the difficulty of assigning monetary values (monetarisation) to achieved benefits and of internalising external costs. It appears to be a common problem that meaningful cost-benefit-analyses - while perceived as useful if not crucial information for potential take-up cities - are hard to carry out.

The evaluation of economical aspect aims at exploring the applicable measures how the various benefits achieved through the measure implementation have actually been expressed in monetary terms. Furthermore, the project evaluators seek information about the “financial sustainability” of the respective measures. In other words, to what extent is the continued operation of a measure (or even the take-up of a measure in another city) dependent on external funding. Finally, it is an option to discuss the importance of carrying out thorough market and transport demand analyses as well as sound investment planning to increase the chances for a successful measure implementation.

STRATEGIC GOALS

	Have these measures been financially sustainable?		TO REDUCE POLLUTION EMISSIONS	TO REDUCE THE DIRECT INTERVENTION OF PUBLIC SUBJECT	TO CREATE A MOBILITY CULTURE/ TO INVOLVE STAKEHOLDER
ACTIONS	DEMAND MANAGEMENT	Transport indicators	Environment Energy indicators	Economy indicators	Society indicators
	NEW FORMS & ALTERNATIVE MODES	Transport indicators	Environment Energy indicators	Economy indicators	Society indicators
	IMPROVEMENT OF PT	Transport indicators	Environment Energy indicators	Economy indicators	Society indicators

Tab 3: Economy: questions for evaluation

Energy and Environment

European cities are characterized by a great level of pollution due to vehicle traffic; the evaluation of energy and environmental aspect aims at identifying the improvement in air quality measured by monitoring stations due to Caravel measures. In a general way, we can say that to verify air quality improvements it's necessary to have great traffic reduction, through the implementation of radical and substantial measures and this is not the case of many Caravel measures, so it is possible that we haven't had great effects on air quality in Caravel demo areas. With small interventions we could however verify vehicle emissions reduction.

To reduce air pollution due to traffic in the cities the more effective measures are access control and road charging in the centre of the city, rationalization of freight distribution, improvement of public transports to discourage the use of private vehicles. During the meeting we will discuss the role of Caravel project in order to support this kind of strategies in the four cities involved.

STRATEGIC GOALS

		In what degree has the measure affected the modal split? Have they help reduce the number of private vehicles? Have they attracted a high number of users?			
ACTIONS	DEMAND MANAGEMENT	Transport indicators	Environment Energy indicators	Economy indicators	Society indicators
	NEW FORMS & ALTERNATIVE MODES	Transport indicators	Environment Energy indicators	Economy indicators	Society indicators
	IMPROVEMENT OF PT	Transport indicators	Environment Energy indicators	Economy indicators	Society indicators

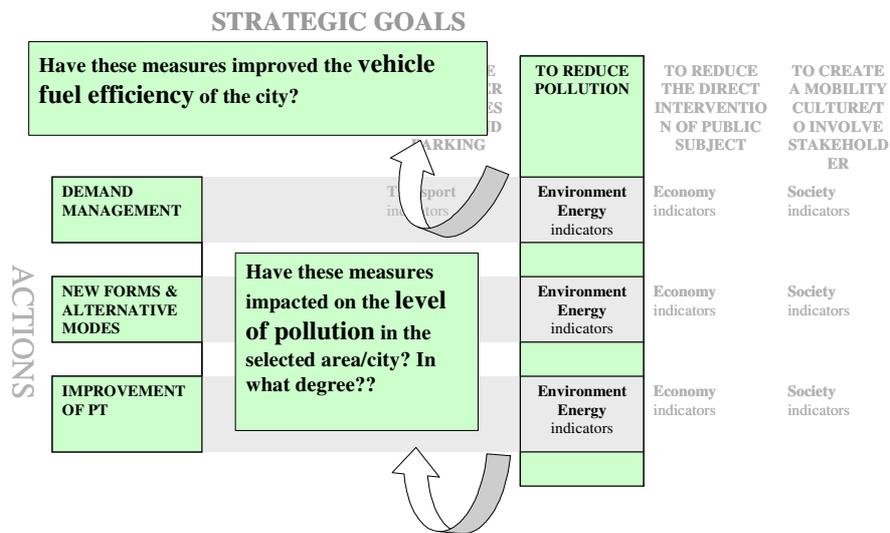
Have the measures improved the quality of the overall PT system?

Tab 4: Environment and Energy: questions for evaluation

Transport

The central vision of CiViTAS is “cleaner and better transport in cities”. Thus, we want to check whether the CARAVEL measures have influenced the modal shift (towards public transport, collective transport, non-motorized transport) and improved the quality of public transport (comfort, punctuality, frequencies, tariffs, accessibility, priority, demand controlled services, etc.) as it is being experienced by the users, in particular by older and impaired people.

All new and alternative transport modes aim to reduce the number of vehicles and to fight against the congestion phenomena well-known at peak hours or around large popular events. Can we show improvements of the transport situations or have the alternative transport modes of the CARAVEL measures initiated additional trips creating further problems? Another key element of urban transport refers to safety. Hardware interventions as well as soft measures aim to reduce injuries (and to influence bad behaviour). Have the CARAVEL measures achieved this objective and what could be done more or better if the implementation would be repeated / replicated elsewhere?



Tab 5: Transport: questions for evaluation

4.AND CARAVEL METHODOLOGICAL APPROACH

Impact and process evaluation

The evaluation task has been divided into two main aspects, impact evaluation and process evaluation:

- (1) **Impact evaluation** includes the evaluation of a wide range of technical, social, economic and other impacts of the measures being implemented by the cities. It involves the identification of common quantitative indicators and their measurement through ‘before’ and ‘after’ surveys and a rigorous assessment of the differences to understand the practical/technical effects of the measures.
- (2) **Process evaluation** involves the evaluation of the processes of planning, implementation and operation including the roles of information, communication and participation. It includes the collation and analysis of activities engaged in throughout the whole process to understand more clearly why measures succeed or fail.

Impact Evaluation is essentially based on ‘before-and-after’ comparisons, but must be carried out consistently across the CIVITAS cities to give the added value gained from being part of a Europe-wide initiative. The Baseline, Business-

as-Usual and After situations provide a common structure for the conduct of surveys and other measurements needed to provide such consistent comparisons.

In order to guarantee an adequate level of detailed information and increase the overall quality of the evaluation approach, a working path has been established altogether with all Local Evaluation Managers:

- Indicators description (units, source of data, Methodology for indicator construction (survey, modeling, etc, Baseline date)
- Methodology for Indicator Construction: where a consistent description on the methods is provided.
- MERS delivery (version B, C, D and final);
- Validation Workshop (november 2008 in Bertinoro (Bologna).

CARAVEL's approach to process evaluation will be based on three complementary pillars :

- i) using the results found within the METEOR project,
- ii) providing input to and getting advice from the GUARD process evaluation database,
- iii) focus group meetings with local stakeholders.

The process evaluation tools aim to identify as early as possible potential (and actual) *barriers* and to overcome the corresponding obstacles during the measure implementation. They also aim to find *drivers* which have the potential to facilitate (or to improve or to accelerate or to promote ...) the measure implementation. The neutral discussion and the explanation of barriers and drivers can be considered as a learning process for measure leaders, technicians, politicians and beneficiaries. However, for many measure leaders and stakeholders, process evaluation represents a new task for which they do not (yet) see the benefits. Therefore, focus group meetings and personal contacts with the local evaluation managers serve first of all for creating awareness and outlining objectives and benefits of process evaluation ; the meetings will rather have the character of training sessions and case study work.

Through the combination of CIVITAS I evaluation guidelines and results, the aggregation of programme wide evaluation inputs (GUARD's database) and the direct contact with those in charge or concerned by measure implementation, the process evaluation can become a powerful means of achieving the measure objectives and introducing lasting and sustainable impacts.

Bertinoro Validation Workshop

On November 11th and 12th a Validation Workshop that will be held in Bologna aiming at preparing the Final Evaluation Report and validating the evaluation results has been organised in Bertinoro (Bologna).

The Validation Workshop aimed at verifying the correspondence between the goals described in CARAVEL project and the results achieved by the four cities. The workshop helped the evaluation group to review, discuss and validate the evaluation results obtained. Furthermore it helped us to identify the lessons learned in the four CARAVEL years and to formulate useful recommendations for urban transport practitioners.

The measures have been bundled according to three themes / three parallel sessions:

- “Demand management and access restrictions”,
- “New forms of vehicle use/ownership & alternative transport modes” and
- “Improvement of public transport”.

This workshop setting allowed a maximum of people to actively participate in the discussion and to discuss the main topics in an appropriate framework. The result validation can only be fulfilled by working as a team and including most of the persons involved in the actual implementation of the CARAVEL measures.

The Validation Workshop started with a joint plenary session explaining the workshop's program, the overall expectations and a general presentation of the evaluation results in the four cities. During the following day, Measure Leaders, Site Coordinators and evaluators discussed within the parallel sessions along the lines of the topics of

evaluation. Each parallel session will be coordinated by a moderator and a rapporteur. Finally, the workshop ended with a plenary session in which the rapporteurs will sum up the discussion results.

5. THE IMPACT: KEY EVALUATION RESULTS

5.1 Demand Management: Access Control Strategies And Rationalisation Of Freight Distribution

The actions of the first group “Demand management: access control strategies and rationalisation of freight distribution include:

- the rationalisation of goods distribution through an increase in the load coefficients and the reduction of the displacement of empty vehicles;
- the favoring of the integration between operators in the sector of the transportation of goods;
- the limitation of circulation and stop of private vehicles with tariffs and prohibitions (of absolute nature of by time bands), pedestrian zones, with limited traffic or stop.

The measures involved are the following:

6,2	Bur	Integrated access restriction strategy
6,5	Bur	Parking strategy & management
10,2	Bur	New goods distribution scheme
11,11	Bur	Access for mobility impaired people
11,12	Bur	Safe access for pedestrian to peripheral neighbourhoods
7,1	Gen	Integrated access control strategy & road charging scheme
10,1	Gen	Enlarged goods distribution scheme
6,1	Kra	Integrated access control strategy
6,4	Kra	Enforcement of access restrictions
10,3	Kra	New goods distribution scheme
6,3	Stu	Access restrictions

Have Caravel measures impacted on the level of pollution in the selected area/city? In what degree?

In general the policies aiming at restricting the access to a certain area of the city, both for private cars and distribution of goods, should in the long run reduce the level of emissions and improve the air quality. However it can also be said, that in order to have good results in this field the measures should be radical.

The main indicators used to assess these measures are: CO₂ levels, Nox levels, particulate levels, CO₂ emissions, Nox emissions, particulate emissions.

In the four Caravel cities results have been clearly achieved, but often the magnitude of the results is not clear, due to the strong interaction with external factors. For example Stuttgart has significantly reduced during Caravel period the exceedances of small particulate matters (PM₁₀), but these are also the result of good conditions during the measurement (good weather, stable conditions, etc).

In a general way it's important to underline that it's very difficult to collect good and clear data for concentration (CO₂ levels, NO_x levels, particulate levels). The indicators identified are correct, the problem is that the results achieved by measurement are not relevant and they are risky, because there are a lot of factors that affect their measurement. A general statement from Caravel is that concrete effects can only be proved with emissions and dispersion modelling.

As a general statement we can say that in most cases there has been an improvement from the beginning to the end of Caravel project, but it is small at city level (and often also at the level of the area of intervention) because the measures are not radical enough to produce good real, radical changes.

In fact we can say that to verify air quality improvements it's necessary to have great traffic reduction, through the implementation of radical and substantial measures and politicians most of the time are not willing to run the risk of becoming unpopular because of this.

With small interventions at least we could verify vehicle emissions (CO₂, NO_x, particulate emissions) reduction, but it's difficult to find some effects upon air quality.

Also with reference to the noise levels, modelling is the right way to measure it.

In order to give a more specific description about the results achieved by Caravel measures linked to "demand management" with regard to environmental aspects it's important to specify some data.

As mentioned, measure 6.3 "Policy options for access restriction" in Stuttgart, is one of the measure that has achieved the best results for the reduction of pollution levels. As a result of the first action (A1 – "Ban for heavy duty vehicles passing through Stuttgart") on average there was a reduction of heavy duty vehicles amounting to approx. **10 %** for the entire city area.

The emissions are influenced by the number of vehicles, because the more vehicles on the road the more emissions are set free. As a result of the traffic counting and the emission modelling **a reduction of PM₁₀ and NO_x emissions by 8 % was determined** due to less HDVs after the introduction of the measure A1.

This measure was one of the most effective measures in terms of emission reduction.

Focusing on the second action of 6.3 measure, the effect of the environmental zone (A2) on the emissions as well as on the ambient air concentrations is less than for A1 **and amounts approx. 2 to 3 %**.

To reduce the air pollution more effectively even more measures with higher reduction potential will have to be implemented in future.

We also point out the third action, "introduction of pedestrian crossings" (A3). The vehicle speed is also influencing the emissions. In the range between 20 and 70 km/h the emissions increase with lower speed. They increase only very slightly for passenger cars, but more for HDVs. A slight increase by 2 % of the emissions due to lower vehicle speed could be determined after the introduction of Measure A3.

Traffic jams have a great influence on emissions. In congested traffic flow the emissions are much higher (factor 2 to 4!) than for fluent traffic flow with constant vehicle fleet. Therefore traffic congestion has to be avoided. The results of the investigations show that there was no influence of Measure A3 with regard to the amount of traffic jams and therefore there was no influence on the emissions due to speed reduction. In total the emissions were approx. 6 % lower for the period after the introduction of Measure A3 than before, but this was due to the reduction of traffic volume of HDVs and not because of the effect of Measure A3. Without the simultaneous reduction of HDVs during the test period, the total effect of the measure on the air pollution situation would have been even negative, as emissions would have increased by approx. 2 %!

This remark points out the potential conflict between different objectives. In this case there is, however, a positive effect in terms of traffic safety and more comfort for pedestrians (who no longer must use underground passage).

In Genoa there is a great pollution due to vehicle traffic; during Caravel period we haven't verified an improvement in air quality measured by monitoring stations due to Caravel measures, because we can say that there haven't been important measures aiming at traffic reduction.

The measures that in Genoa could have been important for traffic reduction were measure "7.1 integrated access control strategy and road charging scheme in Genoa" and measure "10.1 Enlarged goods distribution scheme in Genoa".

However during the project the first one has been changed and the second one hasn't been completely realized, so that we haven't had great effects on air quality in Caravel demo areas due to these measures.

In the other cities, the measures as 6.02 in Burgos "Integrated access restriction strategy" and the measure 6.01 "Integrated access control strategy" in Krakow, seem to have impacted positively on the level of pollution in terms of emissions and concentration.

IN Burgos the results obtained in 2007 (51,75 mg/m³) represent a great reduction in comparison to the data obtained as a baseline (95,5 mg/m³). The reason for this improvement can be the result of the continuous renovation of the most pollutant vehicles of the city, which educe as a consequence the level of emissions.

Moreover, since 207, at least two rings road were opened and many vehicles used these roads instead of crossing the city. As a consequence of this infrastructure the small particulate emissions were reduced drastically.

A general observation linked to Burgos experience is that a lot of emission problems can be solved by introducing more technical improvements, than reducing the number of cars.

In what degree have these measures impacted on the type and number of vehicles moving in the selected area?

The policies tending to reduce the access to certain areas have achieved good results: as it can be seen for Genoa in measure 7.1 "Integrated access control strategy and road charging scheme" and Stuttgart's 6.3 "Policy option for access restriction", where the number of vehicles entering the area has been significantly reduced. The same thing for Krakow's measure 6.4, "Enforcement of access restriction", where the access in the different gates has been reduced.

The main indicators identified for this area are: numbers of vehicles, modal split, traffic flow.

For measure 6.4 "Enforcement of access restriction" in Krakow the key results are as follows: minus 58% vehicles passing trough and finally a reduction of trough traffic **less than 3%** (One of the thirteen gates was covered by electronic identification system)

For measure 7.1 "Integrated access control strategy and road charging scheme" in Genoa, given the changes occurred during the measure lifetime (and the consequent delays for the implementation phase), the data for the evaluation of some actions have been collected just on a limited time period, therefore on the following just the preliminary results are presented:

- **Traffic flows entering the target area = -10 12%**
- **Expected entrances for Implementation stage3 = -884 veh/day**

Is important to underline the specific attention also to the peripheral area, as in Burgos measure 11.12 "Safe access for pedestrians to peripheral neighbourhoods", aimed at *establishing* safer conditions for pedestrian access and mobility in peripheral neighbourhoods.

The pilot project increased the level conditions of the security and safety of the neighbourhoods in surrounding areas. The good results of the pilot project were transferred to other surrounding zones with the same criteria to increase the quality of life of the citizens, improvement the safety and reduction the traffic impact.

In a general way the results for transport - reduce the number of vehicles moving and parking: traffic level, modal split, freight movement - are interesting. In Burgos, through bollards, traffic has been **reduced by 97%** in the restricted area: this as a consequence increase the number of people walking in the area.

In Genoa the application of the parking price schema (BLUAREA) has reduced the average traffic flow accessing the target area of - 5,1%.

Generally speaking, modal split can be affected by so many things: people are coming back to PT because of the economic crisis. As a consequence a comprehensive measurement of modal split is really very expensive.

Have these measures been financially sustainable?

In a general way we have to point out that many measures have not included economy indicators., due to the unavailability and “sensitivity” of cost data.

Some general remarks about the financial sustainability of the measure implemented (e.g. their dependence from external financing) has arisen from the evaluation activity.

In Genoa, measure 7.01 proposed two examples of different schemes: the first one, blue area, is clearly sustainable, because of the low management cost and high revenues. The second one, Mobility credits, is much sensitive to political choices, it depends of how much the municipality wants to charge for access restriction system.

In order to discuss the economical issues linked to access control strategies, a very important point is the necessity to make people aware of the advantages of their paying in order to avoid the “out of pocket money effect”.

In a general way we have to say that we are acting only in view of specific restricted targets, not looking at the overall panorama.

The debate pointed out that one measure is just a small part of the main costs. It will be of high value to produce an evaluation of the overall impact of the introduction of the measure in any given city. The costs are not equally distributed; by doing this there might be an opportunity to re-balance the incomes, responsibilities. Real costs and real benefits should also be considered, but it is very difficult! Ideally in a project like Caravel, it would be good not only to look at the measure but at the city.

A final consideration concerns the cost to cancel the measure. While implementing a measure people tend towards to overestimate the good results and underestimate the bad ones. After some time we can jump to the conclusion that we have created more damages than good. So a new issue arising is what is the cost of cancelling.

Have these measures been accepted by the people directly involved?

In general most of the measures dealing with the access restrictions, that are naturally conflictive, have assessed the acceptance level.

Good results have been achieved in terms of awareness and acceptance from citizens and other subjects directly involved.

The main indicators used are: acceptance and awareness level, on the basis of specific surveys.

In most of the cities the level of acceptance has grown. It can be said that for example even in the case of measure 6.3 “Policy options for access restriction” in Stuttgart, the “ban for heavy vehicles” (A1) and the “environmental zone” (A2) achieved **values of acceptance that were higher than 70%**. In some cases the measures have changed its content and they started later and this situation leads to not being able to follow the trend of the citizens’ acceptance.

For Measure S 06.03 “Policy options for access restriction” in Stuttgart 409 citizens of Stuttgart were interviewed within the public opinion poll. 95 % of the people knew about the problem of air pollution concerning small particulate matter in their city. 65 % of the interview partners knew that as a consequence of the air pollution a Clean Air Programme for their city was established (Clean Air Programme was published in January 2006, interviews were performed from March to May 2007).

The acceptance survey was very successful and serves as a model for a similar study in connection with an action plan on noise reduction. Beyond the measures of the Clean Air Programme additional measures were surveyed. Despite the measure “road pricing” with values of about 30 %, the measures obtained a good level of acceptance and obvious efficiency. Even very “hard” measures, like the introduction of a traffic-free zone within the city centre or a traffic ban for all vehicles during days with exceedances (every 2 nd day in Stuttgart!) obtained high acceptance values.

For measure 10.01 “Enlarged goods distribution scheme” in Genoa good results has been achieved in terms of acceptance for all the actions proposed.

Van sharing – the van sharing service showed a good level of appreciation by the users, and therefore its introduction led to good results; future expansions of the service, related to car sharing service enlargement, give good prospects. Also the proximity warehouse initiative had a good appreciation by the potential users and an innovative suitable technological solution has been found; only the setback in the tender did not permit the realisation of the structure within Caravel.

Finally the Mobility credits scheme - a very innovative scheme - has been developed with a great effort and is now ready for its application: for what concerns the functioning scheme all the possible particular cases have been taken into account; as for the technological supports, all the systems have been developed, integrated and tested. The scheme is ready for its first application, as soon as political decisions will be taken.

In the case of other services oriented to improve the services for specific target groups (inhabitants of peripheral areas, people with reduced mobility) the level of acceptance was good and the new services’ quality has been ranked quite good in general.

An example is measure 11.11 “Access for mobility impaired people” in Burgos, aimed to improve access for individuals with limited mobility that has reached significant results in terms of acceptance. The activities launched to improve the success of impaired people have allowed obtained good results in the perception that this collective has in the accessibility.

Good results has been also obtained in the measure mainly oriented to provide information as 12.04 «Traffic visualisation system » in Burgos.

Thanks to the new equipment included into traffic room and through the telematic panels (joint Measure 12.2.), one important function to the public were improved, to increase the information of traffic on real time.

Main Evaluation Results

The main general results concerning the key-issue “Demand Management: Access Control Strategies and Rationalisation of Frigth Distribution” achieved by the measures implemented through Caravel project are as follows: (a) emissions reduction and general contribution to the improvement of air quality level; (b) heavy traffic reduction ; (c) reduction of through traffic; (d) huge discussions about the different solutions; (e) technical improvement, as for example the improve of traffic light systems; (f) a high level of acceptance, particularly in Burgos; (g) the increase level of occupancy and reduce illegal parking.

Caravel 13 million € they can’t expect to have radical results. More radical measures are necessary to achieve actual results in terms of reduction of emissions.

To have a radical change in the mobility field you need a change of mentality. Demonstration project are in this perspective very important because they are essential to make people think differently.

Radical changes need radical actions: if we want to ban the circulation of cars in the centre we have to do big investments in Pt infrastructures, but the radical steps will not came if we don’t do small things before.

The discussion has highlighted also important unexpected elements during Caravel implementation: *Upscaling of the measure: unexpected form of cooperation between stakeholders; demand of the service in other areas of the city; people have learnt how to do things with caravel and they are applying what they have learned about stakeholders’ involvement, the need to inform people, etc.*

The main general policy recommendations concerning the key-issue “Demand Management: Access Control Strategies and Rationalisation of Frigth Distribution” achieved by the measures implemented through Caravel project are as follows:

- stakeholder involvement has to be planned and implemented following a tailored approach

- “Out of the pocket money effect” has to be taken into account, so it’s very important to try to make people aware of the advantages of their paying. The municipalities should show the real results of the measures, and not just the money.
- political commitment is crucial
- BUT political commitment is nothing without the governance of administrative organisations
- measures are often strongly dependent form local political commitment, but Urban traffic plans can play a strategic role to ensure more continuity

5.2 New Forms Of Vehicle Use/Ownership & Alternative Transport Modes

The actions ascribable to the second groups “New forms of vehicle use/ownership and alternative transport modes” include:

- the stimulation of private collective transport (on behalf of companies for their employees, for example) and the increase of the occupation and use rate of the individual vehicles thanks to the contemporary (car pooling, collective taxi) or sequential (car sharing) use of more users;
- the reduction of the contaminating emissions of individual vehicles through policies aim at promoting the use of different means.

The measures involved are:

8,5	Bur	Collective mobility services for target users
8,7	Bur	New mobility services for visitors
9,1	Bur	Car pooling
9,6	Bur	City bike scheme
11,13	Bur	Increasing bicycle use
9,4	Gen	Car sharing service
8,8	Kra	New leisure related mobility services
9,2	Kra	Car pooling system
9,5	Kra	Policy options for car sharing
9,7	Kra	Bicycle renting
9,3	Stu	Car pooling system

Focusing the attention on the operational goals, the following objectives were identified: marketing strategies, occupancy rate, efficiency of cars (eco driving), how to reduce car travels, increase of bike usage

Have Caravel measures impacted on the level of pollution in the selected area/city? Have they affected the fuel consumption/efficiency? In what degree?

In Germany there is a high environmental awareness (people care about environment) in other countries it is not so obvious. Both in Poland and Spain, the most important aspects of environmental friendly travel decisions is focused on its costs.

The main indicators used to assess these measures are: CO2 levels, Nox levels, particulate levels, CO2 emissions, Nox emissions, particulate emissions.

From an environmental perspective, the most significant results have been achieved in measure 9.4 in Genoa “Car sharing service in Genoa”. Globally, with the level of use of September 2008, in Genoa there has been **an overall saving of 6.000.000 kms/year** about with a significant saving of pollutants.

So now observing the results (coming from the calculations of a specific software tool that considers the types of vehicles and the kms covered and not covered thank the CS service), we can see as the impact of the CS strategy is important to reduce the pollutants: **minus 1.066.920 kg/year of CO₂; minus 4.182 kg/year Nox; minus 384 kg/years PM₁₀, minus 44.410 kg/year CO.**

With reference to vehicle fuel efficiency, the increase in number of less energy-consuming vehicles led to a lower average consumption of the car sharing fleet: for example, it has been achieved a **saving of 0,58 MJ/km per utility car circulating in the urban area**. The average reduction of consumption is about **477.000 liters fuel per year**.

In what degree have these measures affected the modal split? Have they help reduce the number of private vehicles? Have they attracted a high number of users?

The main problem is in which degree has the introduction of these measures affected the modal split (have they attracted a high number of users? Occupation rate per car has changed? Is it possible to observe a modal shift towards alternative transport modes e.g. car pooling, car sharing, bicycle, public transport?)

The answer for these questions is very complicated and refers to the city. Car pooling affects the occupation which is difficult to quantify in Stuttgart where we have data only for the whole city impact. In Krakow it is possible, because all vehicles must enter the gate. Increase car pooling as a number of registered users calculated in all cities, a lot of framework conditions have to mentioned within transferability activities.

Optimal use of car is the strategic goal and it consists of several indicators (occupancy rate, eco driving, modal split). It is not possible to assume one indicator concerning on optimal usage;

Increase of car pooling system is the main operational objective because it is possible to assess the results. The easiest way is to measure occupancy rate.

In Krakow it was done but in Stuttgart not. The reason of it is that in Krakow case, the system was implemented into one company (Technical University) and it was relatively easy to count number of passengers. In Stuttgart the system was covering whole city and direct measurement is impossible, especially when share of car-poolers will be taken into consideration - 1800 registered users (lack of information concerning real number of car-poolers) in comparison to over 70 000 trips during peak hour;

For measure 9.3 “Car pooling” in Stuttgart there has been a significant improvement of the contents of the system (programme) as well as technical upgrading and enhancement. The web site of Stuttgart Pendlernetz has been continuously upgraded by new features and services (email, SMS alert, regional access, event data pool), increased user friendliness, and the possibility for users to feedback their criticism about the system (technical, service-related).

System enlargement by developing and testing the regional access, and event-oriented car-pooling. Both have been successfully implemented and tested. However the overall result of event-car-pooling during the test phase was not that as satisfying as expected in the beginning. Despite several marketing campaigns (radio announcements, banners, videos at highly frequented roads, newsletters, commuter campaign (face of the year), press releases, etc.).

Experience showed that such big events have to be available for the users all the time, each big event like a soccer game must be found by the user at the same place and all the time.

Also in Krakow for measure 9.2 “Car pooling”, the key results are as follows: a high number of users registered in carpooling system, a high number of persons which are interested in carpooling did not significantly changed as a result of measure implementation. And finally an average vehicle occupancy at weekdays increased from 1,11 to 1,19 [pers/veh] what is 7 % growth.

The number of persons using carpooling growth, depending on target group, from 9 to 25 % for fulltime students and from 25 to 56 % for extramural students. However there is a large number of persons using carpooling probably only few of them use developed carpooling website.

Frequency of travelling in carpooling increased from 2,32 to 2,90 [trips/week] (25 %) for fulltime students and from 1,86 to 2,03 [trips/week] (9 %) for extramural students. For fulltime students it is mainly caused by unofficial parking localized close to University.

However frequency of travelling in carpooling increased the average number of passengers in carpooling decreased. It can be caused by increasing number of cars among students which are not familiar with carpooling or simply do not want to use carpooling.

The adoption of car sharing led up to a reduction of 1.050 about of circulating cars in Genoa; in fact (derived by on-field study) each car sharing car substitutes 12 private cars.

With reference to car sharing, measure 9.4 in Genoa “Car sharing service in Genoa” the following results has been achieved for transport. The foreseen CS user number has been achieved. In fact a significant increase of users took place: 417 active contracts on January 2005 and 1.820 active contracts (2184 users) on September 2008.

Moreover the number of cars has been increased from 16 to 98 during the Civitas period and ago d coverage of the urban area has been achieved through the improvement of car

sharing parking places from 15 to 52. Many areas at low demand has been covered. An average of 1.400 Kms per car are monthly driven by car sharing users (average data

of the last six months).

And finally the use of car sharing was introduced in the Municipality of Genoa replacing a part of the proprietary fleet, using 13 vehicles during the working days and hours, which are released and can be used by other users during the non-working hours and the weekends. On September 2008, 250.873 km have been driven on car sharing cars by the Municipality of Genoa for working purposes.

A comprehensive evaluation of the effects of car sharing in the city mobility has been performed analyzing both quantitative and qualitative aspects of the service. The indicators clearly show that there is a progressive reduction of the unitary use of car which during the three years and half of observation has been reduced at the half about.

When taking into consideration the increase in bike usage – surveys are usually not enough due to complexity of the mode relationship and it is possible to verify it only in limited range (e.g. for one company). Calculation of modal split (changes in it) is very difficult for the whole city and requires high investment costs (for example comprehensive travel study). It is much easier to quantify it for one institution. To verify impact of free loan of bike service, it is necessary to estimate number of users, acceptance of usage of bike paths and occupancy of bike racks. Mentioned data are relatively easy to obtain. Very important observation refers to assumed expectations for the obtained results. In all cases there were too high. It was result of suggestion on political level and due to lack of experience.

With reference to measure 11.13 in Burgos “Increasing bicycle use” the key results linked to transport are as follows: an important number of parking spaces were installed by the Council to improve the use of the bicycle. Due to, numerous city administrations and associations asked for parking bicycles close to origin/destination. New phase for acquiring more parking spaces were launched to satisfy the demands of the users.

For measure 9.6 “City bike scheme” in Burgos thanks to the new bike equipment included into city bike scheme proposed and through the several points to loan bicycles, one important function to the public were improved, to introduce availability bikes in the city. The system functioned on real time and received all information of every point and users, the data are treated and sending to the software administration situated in a control company. All process of city bike scheme (info and bikes lending points, bicycles and software) was completed with the Civitas project.

Have these measures been financially sustainable?

The main results concerning economy have been that the expectations are higher than market (see for example car sharing).

It is worth to emphasize, that Caravel measures should not be treated as a source of income. The measures were not financially sustainable and must be subsidized.

With reference to measure 9.4 in Genoa “Car sharing service in Genoa”, relating to the local operator point of view it’s important to reach a configuration of the service (number of cars, users, rides, km covered, etc) able to guarantee the

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attainment of the breakeven point. However this configuration has to keep in mind the needs of the urban mobility. For example, without Caravel project (business-as-usual-scenario) the service wouldn't have covered the low demand zones (as the east zone of Genoa) and perhaps the local operator would have reached the breakeven point, but the positive environmental / energy impacts of the car sharing service there would not have been on these zones.

As mentioned in the previous chapter it is important to reach a trade off between different kind of objectives, sometimes in conflict.

In a general way we can say that there has been uncertainty of available funds and the lack of money for planned measure on local level and during its implementation. This barrier appears in all cities, but thanks to political commitment (Stuttgart) or individual initiatives (Krakow) it was possible to avoid failure within the implementation phase.

Have these measures been accepted as an alternative means of transport?

The main results concerning society have been the change in mobility behaviour and the general raising of acceptance.

Marketing strategy do not seem as strategic goal. It is communication tool, placed somewhere between society and economy.

The important role of politicians and inhabitants has been confirmed by measures' implementation. It was emphasized the necessity of awareness level increasing among both groups. Awareness level can be also treated as a good indicator evaluating implemented measures.

The relevance of stakeholders was emphasised as important driver. It refers to his efficiency in avoiding barriers and bureaucracy inside the administration units.

The measures should be treated as a part of sustainable transport policy due its relatively low impact on traffic conditions.

With reference to measure 9.4 in Genoa "Car sharing service in Genoa", an important part of the Caravel measure has been the analysis of the customer satisfaction by direct surveys (September 2004 and September 2008). So some results are here summarized. The degree of awareness of car sharing in Genoa has reached on September 2008 the 69% of the population; about the business field the awareness level of the service has reached the 64% of interviewed firms. The direct survey of September 2008 has pointed out that the 40% of CS users has a public transport subscription. It means that CS service is able to address the users to a more sustainable mobility behaviour. The satisfaction of the users about the service is high: an average rating of 7,9 over 10 was given by the users (September 2008).

The comparison between the perceived costs and benefits shows a very positive evaluation by the users: 50% thinks benefits are higher than costs and 33% thinks that they are balanced, while only 13% perceive the service as too expensive related to the benefits. The direct survey (September 2008) carried out on car sharing users pointed out that the use of car sharing has reduced the km driven by car for each car sharing user of an average of 2.750 km/year about which represents the 17,2% about of the mileage driven before the adoption of car sharing.

With reference to measure 11.13 in Burgos "Increasing bicycle use", numerous campaigns were done to promote bicycles as mode of transport among users

It was allowed that the bicycle was included in the Urban strategies and new development areas of the city. The cyclist opined that safety and security for them was increased and the bicycle is a mode of transport more adapted to life together with other vehicles.

For measure 9.6 "City bike scheme" in Burgos the quality of service, awareness and acceptance level referred, included the number of users and loans realized by the bike scheme users was very positive. Thanks to the last available technology created integrally by the Instituto Tecnológico de Castilla y León (ITCL) for the city bike system, the operators managed to know the bikes and users situation in different points of the city on real time

Furthermore the continued monitoring of the service by the operators showed some proposals to improve the control of city bike scheme, as new software application and introduction of new electronic equipment.

With reference to the measure 9.01 “Car pooling” in Burgos, through the intense labour by the Mobility Office in the industrial area of Villalonquejar, the average occupancy and the philosophy of car pooling was communicated to users. The perception of the workers is changing and sharing the vehicles has become more common.

The measure was launched in the industrial area with the consensus of the principal associations and union organization collaborated in the development of the planned activity. To inform of the news and the new mobility conditions as regulations, incentives, articles, promotions, meetings were realized by the Mobility Office to all companies and workers. The new mobility platform was designed to encourage people who wanted to share their vehicle. Through incentives and promotional campaign, the web site was more accessible to the workers.

Important results have also been achieved in Stuttgart for measure 9.03 “Car pooling”, first of all the increase in the awareness and acceptance level among private companies and public institutions in Stuttgart and in the Region of Stuttgart with regard to the online car-pooling system Stuttgart Pendlernetz. The awareness level among private companies in Stuttgart and in the Stuttgart Region could have been raised considerably during the project life cycle. Thus big companies like DaimlerChrysler, Bosch, SONY Deutschland and Hewlett Packard, all located in Stuttgart, integrated the system directly into their Intranets and supported promotion actions (flyers, system presentations, posters etc.) within their companies. Altogether 35 companies in Stuttgart and the Region have currently integrated on their web sites a link to Stuttgart Pendlernetz.

Also among public institutions the awareness level has grown, about 30 cities and communities have meanwhile set a Pendlernetz link on their web sites. Moreover the great success can also be seen in the efforts to build up a Baden-Wuerttemberg-wide car-pooling system, which is envisaged by the Baden-Wuerttemberg Ministry of the Interior at the moment. This also supported by the installation of a Baden-Wuerttemberg-wide and Germany wide working group “Pendlernetz” with the vision of introducing a Germany-wide system in system.

Finally for measure 9.2 in Krakow focused on car pooling system; Good results were obtained for indicators like “Awareness level” and “Number of persons interested in car pooling” after the system implementation. The value of indicator “Awareness level” doubled after the implementation.

Main Evaluation Results

The main general results concerning the key-issue New Forms Of Vehicle Use/Ownership & Alternative Transport Modes”, achieved by the measures implemented through Caravel project are as follows: (a) New users; (b) Systems enlargement and improvements; (c) Increasing of awareness and acceptance; (d) the governance of administration is crucial; (e) push of private sector.

Willingness of all peoples involved in Caravel can help in forcing assumed activities. However its complexity in the frame of organizational issues can be the reason of potentials barriers. Political commitment on mayor level can not be enough to implement measure – many departments and many people are not interested in results (do not care about it). So also with reference to “new forms of vehicle use & ownership and alternative transport modes”, the governance of administration has been confirmed as a crucial aspect.

5.3 Improvement of Public Transport

The actions ascribable to the third group “Improvement of PT” comprise:

- an increase in the speed of collective public transport, even physically protected and with adequate technical innovations;
- the promotion of the tariff integration between different collective public means (sub-regional railroads, subways, bus lines, etc) in order to avoid an inefficient duplication of the offer;
- the reduction of the contaminating emissions of the collective vehicles through regulations and incentives for the use of alternative means.

The measures involved are:

5,2	Bur	Support for clean fuels & intro of clean public & private vehicles
8,2	Bur	Clean high mobility services
5,1	Gen	Transition towards clean vehicle fleets
8,1	Gen	Clean high mobility corridor
8.4A	Gen	Agency for flexible transport services and new mobility services
12,5	Gen	Bus lane control system
5,3	Kra	Transition towards clean vehicle fleets
8,3	Kra	Clean high mobility corridor
8,6	Kra	Demand responsive transport services
8,10	Kra	Integrated ticketing and tariffs
12,6	Kra	Public transport priority system

With reference to the key issue “Improvement of Public Transport” the following goals were identified: *the increase the quality of PT, the increase PT safety and security, the reduction of pollution, the improvement of PT services, the gain of new PT users.*

IN a general way we can say that the ultimate aim however should be to induce a modal shift from private to public transport. There is a correlation between this ultimate aim and the mentioned: if you achieve the one, you will almost automatically achieve the others.

Usually people in western countries tend to prefer that mode of transport that makes them lose less time. They want to get to their destination as quick as possible. Thus, the general approach should be to reduce the conditions for private car users and to improve the situation of PT.

Urban density is another crucial factor for the choice of mode of transport. In relation to density the availability and usage of PT increases or decreases. A Demand Responsive Transport Service, as proposed in the case of Krakow through the measure K.06 “Demand-responsive transport services”, is the best service for low density areas without PT. The integration between PT and cars have to be wished: in high density areas we have to support as much as possible the use PT, in low density areas it’s necessary to link cars to PT. *In any case PT planning should be linked with land use planning.*

With reference to the relationship between eastern and western countries, discussed during Caravel project. It is comprehensible that eastern countries want to make up with western parts, but in so doing they should learn and profit from past mistakes of the western countries.

Focusing the attention on the operational goals, the following objectives were identified and discussed: the optimisation of lines and equipment of PT, the improvement of PT infrastructures and equipments, the improvement of information, the implementation of high mobility corridors, the test of new PT technology in specific local conditions, the implementation of clean fleet and clean services.

Two different areas of intervention can be distinguished. While the objectives “*Optimisation of lines and equipment of PT, Improvement of PT infrastructures and equipments, Improve information, High mobility corridors*” refer to infrastructural aspects, the objectives “*Test a new PT technology in specific local conditions and clean fleet and clean services*” rather refer to vehicles.

With reference to “PT improvement” the following general highlights emerged from Caravel activity.

The proportion of elderly will increase. This should be taken more into account in public transport (PT) and makes very important to test new forms of vehicle use/ownership and to test alternative modes of transport.

Another important point is that the ‘Food vs. Fuel‘ discussion influenced the image of biofuels → reduces the use in private transport

In what degree have these measures improved the quality of the air in the city by lowering the degree of emissions?

The importance environmental and energy aspects has been confirmed. The main goals for European mobility in cities on the part of energy are: (i) Reduce the demand for (senseless) mobility; (ii) Improve efficiency of vehicles; (iii) Shift from individual to public transport.

It has to be said that to achieve consistent results in this field, the introduction of radical measures is required.

In order to give a more specific description about the results achieved by Caravel with reference to environmental aspects in “PT improvement”, it’s important to discuss some data.

For measure 8.01 in Genoa “Clean high mobility corridor”, the air quality data measured at the local monitoring station are referred to the 4 years of the project, they show that there has been a decrease in CO levels. CO pollution is strictly related to traffic emissions and it is particularly high in case of congested traffic (stop and go). The decrease of CO levels shows that the traffic in the area involved in measure 8.01 have been less congested and that the number of vehicles in the area has decreased. This may be due to the improvement of public transport services in the area and to the consequent increase in the use of bus instead of private vehicles.

NOx and PM10 levels haven't been clearly influenced by the traffic reduction; this is probably due to the fact that NOx and PM10 levels are influenced also by heating emissions and by other factors like sea salt events for PM10.

For measure 5.1 in Genoa “Transition towards a clean vehicle fleets”, the following details can be pointed out. The results in reduction of pollution produced by AMT buses (2008 vs. 2005) due to the implementation of the Strategy Plan are the following:

- reduction of about **16% of CO emissions g/km.**
- reduction of about **4% of Nox emission g/km;**
- reduction of about **28% in PM 10 emissions g/km.**

Considering energy aspects, in measure 5.1 in Genoa “Transition towards a clean vehicle fleets”, the chosen indicator (fuel mix) shows the energy consumptions of clean vehicles in comparison with total energy consumption (clean and not clean vehicles). More in details the indicator shows the market share for clean energy consumption - electricity and natural gas (methane) compared to total energy consumption (electricity, natural methane gas, gasoline, diesel, white diesel).

At the end of 2008 about **6% of the total energy consumption is produced using clean energy (electricity and methane)**. The increasing in the Clean energy consumption is more than **+ 1,5%** (2008 vs. 2005). This results are related to the increasing in Km ridden by clean vehicles (+ 4,16% 2008 vs. 2005), especially subway, as well as to the fact that trolleybuses started working.

For measure 5.2 in Burgos “Support for clean fuels and introduction of clean public and private fleets”, the key result is the acquisition of new buses for using Natural Gas and biodiesel: thanks to vehicles obtained by the Council and Public Transport services (acquisition of new buses for using natural gas and biodiesel), **the fleet of Burgos is the youngest of Spain**. It’s important to point out that the introduction of fuels served as the example for the citizens which began to use new fuels, as biodiesel in own cars.

The occupation of vehicles (person/km) is a crucial item to be taken into account when evaluating the impact of measures, especially in terms of energy efficiency. Rail road often seems to be not energy efficient in terms of person/km when not occupied. But in fact, if occupied it is more efficient than private transport (individual car occupancy).

The METEOR methodology does not cover the indicator ‘occupation of vehicles per person/km’ but from energetic point of view we have to compare also occupancy of vehicles.

From economic point of view only (high) occupancy is the decisive factor, but for CARAVEL also quality is important: thus, the highest possible occupation is not always the optimal occupation in terms of comfort for passenger. A balance needs to be found and the fleet is to be designed in a way to ensure service even in peak times.

Without the consideration of energy efficiency per person/km by measuring ‘occupation of vehicles’ even a worse situation as to energy efficiency could emerge e.g. due to the energy consuming application of air conditioning (AC) in buses. However, the better quality of PT through AC can raise the occupancy and thus increase the efficiency again. The costs for monitoring occupancy, the data collection has to be considered in future projects.

In this perspective budget for collecting data on occupation should be reserved in future projects.

Have the measures improved the quality of the overall PT system?

There has been a raise in the number of PT users in Burgos as a consequence of the improvement perceived in the services. The same can be said about the DRT in Krakow.

There has been an improvement of the quality of PT in Genoa, with specific reference to timekeeping and average bus speed, as result of measure 8.1. “Clean high mobility corridors”. Furthermore Burgos and Genoa have introduced new more eco-friendly buses.

With reference to the measure 8.01 “Clean high mobility corridor in Genoa”, the question *In what degree has the measure impacted on the time travel and use of PT?* should be extended to other lines, too. For evaluation purposes all results have to be considered not just selected lines, since impact of intervention on one line influences also other lines. One has to consider the whole package.

Measure 8.2 “Clean high mobility services” in Burgos shows very good results in terms of PT accessibility perception. More in details thanks to the new equipment included into measure proposed, the public transport increased the acceptance of the users and a high acceptance among citizens has been assessed. Moreover the continued monitoring of the service by the operators showed some proposals to improve the lines, the bus stops, the card system and some info tools for the users. Finally the users consider that the accessibility of the PT is adequate and some improvements should be launched to reduce the pressure of the private cars in the bus stops.

In general a continuous increasing of the passengers in public transport can be verified in Burgos. The data show the clear tendency to increase the number of passangers every year since the baseline data in 2004 to 2007. In this period the PT increased 5.61 % the number of passangers.

Others important suggestions arose form measure 8.4 A in Genoa “Agency for flexible Transport services”. Public transport operators show a very high interest in flexible service, as they can provide an efficient solution where traditional bus services are not able to respond to citizens needs.

The number of transported passengers in strongly influenced by the context where a flexible service is developed. The trail success is connected not only on the number of passengers per month, but also on registered users and registered users / target area residents ratio.

Finally a flexible service is always perceived by users as a very high quality level service, and it has an appeal on citizens higher than traditional public transport services.

Have these measures been financially sustainable?

One general remark that can be applied to all sort of flexible services is that they require the existence of public funds; in fact every low demand service is not able to cover operating costs with fares (8.4A Genoa and 8.6 Krakow). A results for Krakow was the **cost increase** – the Tele-bus is an additional service in the PT offer so the costs of PT are higher when comparing to the situation before the Tele-bus introduction.

For measure K 8.06 “Demand- responsive transport services” in Krakow the following observations have to be pointed out concerning the added revenue: People that are using the DRT can use their periodical tickets. Therefore, there is no need of separate tickets. As a result MPK is not able to evaluate the revenue coming exclusively from the DRT. However, within a research study (made by a student) 100 users were interviewed also about tickets. The result is that the majority of users are using periodical ticket. The additional revenue might come from people using one hour single tickets (9 %). But these are just conclusions, no real results in money.

Have they been accepted and perceive as useful tools?

The quality of transport services has been perceived as improved not only in Burgos. Regarding the DRT services, implemented both on Genoa and Krakow, it can be said that in general when they are accepted as a valid tool, users show a great level of satisfaction. The awareness and acceptance levels have grown in all cities probably due to a good level of dissemination of the measure and of its good results.

For measure 8.06 in Krakow “Demand-responsive transport services”, one of the key results has been the social acceptance for the new kind of PT service, due to the continuous increase of users registered in the Tele-bus system proves a bigger interest in the flexible PT service. The sum of passengers transported by conventional lines and the Tele-bus vehicles has increased in comparison to the amount from the similar period before the service launch.

With reference to DRT has been verified that local media and specific leaflet delivered on the whole target area are the best instrument in order to increase the awareness level of a flexible service in the launch stage. During the years the awareness level continues to grow thanks to decorated vehicles circulating on the road and users passing the word.

Main Evaluation Results

The main general results concerning the key-issue “PT improvement” achieved by the measures implemented through Caravel project are as follows: (a) A noticeable result is the increase of PT passengers. This refers to the ultimate aim to induce a modal shift from private to public transport; (b) *Increased number of PT use of biodiesel*; (c) *more accuracy*; (d) *Uptake of training*; (e) *Transfer of technology*; (f) *Good cooperation between partners*.

Most important driver should be the demand on private transport since the biggest problem is the congestion of urban centres and PT is the only solution. We have to reflect on alternatives to cars in order to reach optimal combination between PT and private transport.

A recommendation raised is that the start of the implementation of measures should be after an election or at the start of a new policy period. This will ensure a stronger political commitment.

The main general results concerning the key-issue “PT improvement” achieved by the measures implemented through Caravel project are as follows: Lack of money seems to be the biggest barrier as to the implementation of ‘hard’ measures. This means that we are forced to concentrate it on certain, selected issues; *Public consultations and involvement already at the planning stage not at the implementation stage, introduce contact less card in advance*

The project CARAVEL was an added value to the ongoing PT activities in the cities. CARAVEL has contributed more on a ‘soft’ level. It was considered as an information platform for transnational exchange. Information is the core business to PT.

CARAVEL has also contributed to essential modifications. But the biggest impact of CARAVEL was that it has evoked a rethinking on local level (**mental change**). PT is now more considered as a worth issue to deal with. Once it has resulted in more PT users, it has also accumulated new actions and resources. CARAVEL has stressed the importance of PT within the politics. It has acted like a ‘starter’ that kicked off pilots and new actions. All in all, CARAVEL is rather a research than an investment project.

5.4 Sustainable Mobility Marketing

The actions ascribable to the fourth group “Sustainable mobility marketing” include:

- the creation of informative points and forums of communication dealing with the sustainable mobility topic.

The measures involved are:

11,2	Bur	Sustainable mobility marketing
11,6	Bur	Mobility forum
11,1	Gen	Sustainable mobility marketing & Ecopoints
11,5	Gen	Mobility forum
11,3	Kra	Sustainable mobility marketing
11,7	Kra	Mobility forum
11,4	Stu	Sustainable mobility marketing

This kind of measure aims at supporting the dissemination of a sustainable mobility culture. The actions implemented include mainly the creation of informative points and forum of communication dealing with the sustainable mobility topic.

The indicators used to assess the impact of the measures are: number of participants, awareness and acceptance level. In a general way we can say that these measures have been important in order to produce marketing concept to raise public awareness.

The main results can be summarised as follow:

- High acceptance of the measures among the operators
- Proposal for additional improvements
- Active involvement of operators
- Behaviour change in politicians and technicians of the four cities involved in Caravel project
- Transfer of measure to other areas of the city

5.5 Mobility Plans and Traffic Management

The actions ascribable to the fifth group “Mobility plans and traffic management” comprise:

- the elaboration and implementation of specific mobility plans;
- the use of telecommunications and telematics to shorten and optimize the displacements and trips (information on the transport systems).

The measures involved are:

12,4	Bur	Traffic visualisation system
11,15	Bur	Safety and accident prevention plan
12,2	Bur	Info-mobility tools
11,8	Gen	Integrated mobility plan for San Martino hospital
11,10	Gen	Integrated mobility strategy for trade fairs
11,14	Gen	Monitoring centre for road safety and accident prevention
11,17	Gen	Decision support tool for environmental impact assessment of traffic planning measures
12,1	Gen	Intermodal infomobility platform
8,11	Kra	Security action plan for public transport
12,3	Kra	Info-mobility platform
11,9	Kra	Integrated mobility plan for Technical University of Krakow
11,16	Kra	Monitoring centre for road safety and accident prevention
8,12	Stu	Security action plan
12,7	Stu	Event-oriented traffic management

Concerning mobility plans, significant results has been achieved in all the cities. The specific plan for Trade Fairs, measure 11.10 in Genoa, focused mainly on parking management, traffic flow and circulation schemes, ticket integration, pedestrian routes, public transport and integrated information; together these contributed to improved accessibility of the area, as confirmed by more than 40% of visitors.

The general objectives of the plan to improve the accessibility to the San Martino Hospital, measure 11.8 in Genoa, were to improve the general mobility behaviour of employees and visitors alike. With these aims in mind a General Mobility Plan (GMP) and a Home Work Trip Plan (HWTP) were drawn up for employees, providing for a number of different and integrated measures. These include a car pooling system for the employees, special connections from critical points in the city to the hospital, the extension of the public transport system inside the hospital zone, an info-mobility platform and the use of nonpollutant vehicles for movements within the hospital zone.

For traffic management, Burgos measure 12.4 give a good example of the kind of results achieved. The Traffic Control Room received all information of cameras and other traffic systems, the data are treated and sending to the panels situated in different places of the city. All process of traffic information (state of traffic, data treated and public communication) was completed with the Civitas project.

The quality of service and acceptance level referred by the operators in the Traffic Control Room was very positive which was due to the last available technology for traffic visualization system which allows the operators to know on real time the traffic situation in different points of the city and modify it thanks to new applications of the software.

The continued monitoring of the service by the operators showed some proposals to improve the control of the traffic system, as new software application and introduction of new additional cameras.

The new application introduced allowed that other information systems could be included to inform the state of traffic in the city and to improve the better the traffic conditions for the citizens.

Two main results raised from these measures:

- the topic of technological research is confirmed as an issue of vital importance to reduce the number and length of these displacements, to improve the existing relations and to re-balance the modal split;
- measures are often strongly dependent from local political commitment in this sense traffic plans can play a strategic role in ensuring more continuity

6. CARAVEL AS A DRIVER FOR CHANGE

The previous paragraphs have described and discussed the main quantitative results achieved through the Caravel project. These results have allowed to take into consideration in an integrated way the different areas dealing with urban mobility (economy, society, environment, energy and transport). It is however important to underline that a relevant impact of the project is based on its capacity to face in a direct way the main criticalities linked to urban mobility in European cities, that are described below.

The literature review, individuates four main criticalities connected with the subject of urban mobility that deal with political, social and financial aspects.

The first one has to do with political aspects and it's ascribable to a general indifference towards, not only the knowledge of the mobility problems (data collection and analysis, financing of studies and experiments, etc), but also a lack of interest on the mechanisms and government of movements/displacements. The main consequence of this attitude is on the one hand the historical lack of coordination between services dealing with transport and those dealing with the territorial government, and on the other hand the lack of integration between different policies.

The second criticality deals with social aspects. From the social point of view certain habits and lifestyles can be identified and not only they determine the characteristics of the mobility demand (preponderance of individual transport of people and of transports of goods done by third parties) but inevitably they orient the decisions made by politicians that are the expression of that lifestyle. In this perspective are of fundamental importance the instructive mechanisms that are the basis of sustainable mobility choices. It is on the basis of these instructive/educational mechanisms that is possible to legitimate a more incisive public intervention aiming at tutoring the collective interests. The absence of a correct perception of the real damages these displacements produce has in fact induced citizens to move more that what would be optimal with non adequate means, etc.

The third criticality is of financial nature: on one side collective transport has long been largely subsidized , while on the other private transport has affirmed itself on a level of displacements conditioned by the fact that users do not take responsibility for the costs they produce and its is therefore non optimal and largely superior to what would be derived from the principle that states that each one should pay for what they pollute.

As underlined, *“the great anomaly of this segment of Economy, is that if each one should pay for the mobility as a good (people and goods) where everyone stresses the absolute need for economic prosperity and the city's economic life, a price equal to its production cost – including a share of the used infrastructure, externalities produced, etc- nobody would move”*.

Finally it is important to add to the criticalities already explained, the topic of technological research that is of vital importance to reduce the number and length of these displacements, to improve the existing relations and to re-balance the modal split.

The subject of research and development applied to transports is of main importance and is within this field that the main results of Caravel and the whole Civitas initiative are based on. It can be said that they mean to directly attack the main criticalities of urban mobility, promote innovative actions and deeply permeate the administrative culture.

As a conclusion it is important to underline that within the Caravel project, the size of the cities involved has turned to be a very important aspect. It can be said that the implementation of measures in a city of small/medium size dimensions (Burgos) has achieved more tangible results than in the other cities that have a larger dimension. This statement is based upon the following considerations:

- in the first place the results of the measures could be perceived more concretely by the interested subjects and this contributes considerably not only in the generation of consensus, but also in the full appraisal of the potential feedback of the measures at local level (for example upscaling of the measure, application of the action in area upon request of the citizens, etc);
- the relevance of the measures in terms of their impact tends to be more significant if confronted with other policies activated at local level;
- the decisional processes generally tend to be shorter and less complex than in bigger cities and this allows a decision making process that is more coherent with the limited duration of the Caravel project.

In this kind of context the factors ‘modernisation, new solutions, exchange and pilot experience’ have led to concrete quantitative results (e.g an increase in PT users). This again has led to a deeper analysis and even more actions with new money. Finally, this has led to a change of priorities on local level. One could say: each CARAVEL Euro has generated new Euros for innovative actions. Thus, CARAVEL acts as a driver for changes. It was also successful in shifting the attention to more social aspects of PT.

CARAVEL Feedback Process:

