

**DEMOCRITOS**

**DEveloping the MObility CRedits Integrated platform enabling travellers  
TO improve urban transport Sustainability**

**FINAL PUBLISHABLE SUMMARY REPORT**

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# 1. Final publishable summary report

## 1.1. Executive summary

The collaborative 24-months research project “DEMOCRITOS” concerns the introduction of decentralized emission permits markets within the transport sector, as an alternative mean to attain GreenHouse Gases emissions objectives.

The concept of the Mobility Credits Model is based on four pillars:

- Define a sustainable load of GHG (GreenHouse Gases) in an urban area;
- Convert this load into a “total amount of credits”, that will become the common “currency” to be spent within the assigned budget limit using an Electronic GHG wallet, and will be distributed to all the travelers;
- Define a set of rules to use the credits;
- Exchange credits allowing travelers with a negative balance to buy extra-credits from other travelers who are credit positive.

The project introduces the Mobility Credits Model as a transport specific platform that will enable travelers, mobility providers, technology providers and transport planners to understand the implications of climate policy and increasing prices for greenhouse gas emissions and to identify new opportunities in urban mobility first and in extra-urban mobility later.

Within the DEMOCRITOS project:

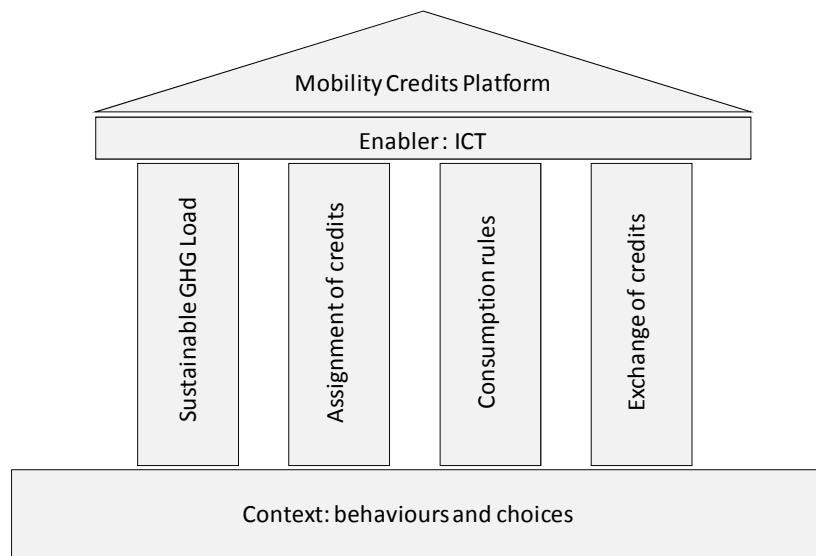
- a comprehensive and consistent theoretical framework has been developed, in order to provide a solid background addressing all the implementation issues and effects of the integrated platform;
- the technology architecture to support the Mobility Credits Platform has been defined;
- the long term effects of the Mobility Credits Model application have been assessed;
- the simulations of specific case studies (cities of Genoa, Stuttgart, Lisbon and Craiova) provided the necessary insight in order to verify:
  - the effectiveness of the Mobility Credits Platform in providing awareness on the GHG issue;
  - the potential reduction of GHG due to adoption of the Mobility Credits Platform in the different application contexts;
  - the efficiency of the Mobility Credits Platform to tackle the environmental issues related to urban mobility, expanding its action field to the other externalities produced by urban transport;
- all the results achieved in the case studies have been compared for the finalization of the Mobility Credits scheme both for the participating cities and for European municipalities and regions.

In summary, DEMOCRITOS research has shown Mobility Credits as a powerful tool to address urban mobility. It does have advantages and disadvantages compared to other instruments. The recently publish White Paper on Transport Policy puts forward several challenges that need to be addressed at urban level, even acknowledging that the subsidiary principle does limit the possibilities for EU action at such level. Accordingly, exploring new policy instruments and opening up new opportunities for local authorities to address the challenges of transport policy and exchanging experiences between countries and cities is a potentially important contribution from the European level towards the local instances that should be further explored.

## 1.2. Summary description of project context and objectives

The DEMOCRITOS project introduces the “Mobility Credits Model” as a transport specific platform that will enable travelers, mobility providers, technology providers and transport planners to understand the implications of climate policy and increasing prices for greenhouse gas emissions and to identify new opportunities in urban mobility first and in extra-urban mobility later.

The rationale of the Mobility Credits Model is based on setting as quantitative target the “sustainable load of GHG (Greenhouse Gases)” of the study area. Subsequently the GHG load is converted into a “total amount of mobility credits” distributed to all the travellers of the area. Based on their mobility behaviours, individuals “consume” their initial endowment of mobility credits. In addition, depending on their mobility habits, people could have needs higher or lower than the mobility budget assigned: as a reaction, exchange mechanisms develop in the system, regulated through a sort of bank where credits are bought by the individuals or returned with monetary benefit in case they have been unused.



Capturing the requirements of the topic “to enable travellers to understand and reduce greenhouse emissions related to mobility and consumption choices”, we notice that providing information is not enough. That would leave travellers without a compelling proposition to adjust their behaviours and choices. That could may be enough to “understand” but surely not to “reduce”. On the contrary, we believe it is necessary to create a behavioural context where the travellers can experience the effects of changing attitudes and choices in mobility.

The “Mobility Credits Model” allows to create this context within a range of possible implementations, from a “pedagogic tool” to a “mandatory demand management scheme”.

The mechanism of this context is to set a quantitative target (e.g. an allowable threshold of CO<sub>2</sub> production), to make the approach path to the target measurable (how much CO<sub>2</sub> is not produced on account of a different mobility behaviour) and to apply a driving force (incentive or obligation) from the current status to the target.

### 1.2.1 Project objectives

The goal of the DEMOCRITOS Project is to establish an exhaustive framework of the Mobility Credits Model aiming at:

- Enhancing the theoretical framework addressing medium and long term effects (re-location of

industrial, commercial and residential activities, inflation in prices of goods and services, local competitiveness, effect on tourism, ...);

- Exploring different ways to implement the basic pillars of the model: theoretical schemes to define the charge area and to measure “the sustainable load”; load-credits ratio; alternative policies to an even distribution of credits; rules; exchange models;
- Exploring how the model could spur innovation in individual transport means through a positive selective pressure to induce the use of low-polluting, low consumption and small vehicles;
- Assessing the implications of different technology scenarios (automotive, other transport means, electronics, sensors, and mobile communications) and how they can fit into the model;
- Assessing the social awareness and concerns in applying such pervasive monitoring.

### 1.2.2 Expected final results

At the end of the project, the following results will be obtained:

- Municipalities and regional authorities of the consortium will have a sound basis to decide upon the adoption of the Mobility Credits Platform as a mean to influence the travellers’ choices in order to reduce greenhouse gases;
- Consultancies will have a clear understanding of the concept and of the associated technologies to assist public administrators, municipalities, enterprises, interest groups, communities and citizens in Europe and outside Europe to implement the platform.

The Mobility Credits Model will provide a paradigm change in transport, addressing impact on climate change and energy dependency, through the following mechanisms:

- It applies a pull mechanism to the supply chain of the transportation industry, instead of the push on some rings of the chain (e.g. carmakers to meet unlikely targets in CO<sub>2</sub> production), starting from the citizens, their choices and their behaviours. In this case the carmakers will have to supply products allowing the citizen to cope with the rules in a truly competitive market where size and off-design performances in actual conditions will make the difference. The externality meter shifts emphasis from specifying the products to governing the actual final effects, whatever the product. In principle, this would allow to extend the Kyoto protocol on CO<sub>2</sub> to transportation.
- It applies a constant pressure to deliver efficiency and cleanness acting upon the “sustainable load of externalities” which can be progressively decreased in order to achieve specific moving targets.
- It applies to all modes of transport, each considered for its contribution to the generation of externalities with particular emphasis on greenhouse gases.
- It allows to constantly assess the effects of the different policies and to fine tune the rules even through self-adaptive mechanisms.
- It recognizes that in large metropolitan areas it is necessary to take into account externalities generated in wide areas, not only in the central areas and that cordon crossing is just the entry level of charging (change from access charge to use charge);
- It can be easily extended to the whole territory including extra-urban routes and enabling a new taxation scheme based on externalities to parallel current taxation based only on income.

The multiple possible schemes imply that several aspects of mobility, society, demography, politics, economy and laws will be addressed.

### 1.2.3 Potential impact and use

Working on the two dimensions of “scope” and “adoption” we can easily identify at least four base application contexts of the Mobility Credits Model:

1. A demand management policy would result from a wide scope (e.g. the population of a metropolitan area or a region) and a mandatory action requiring each citizen to be involved;
2. An information platform in a wide area (wide scope, spontaneous adoption) where citizens have incentives to “play the credit game” on a voluntary adoption base (e.g. sponsored by public transport companies or as a way to promote the use of Location Based Services);
3. A social network (narrow scope, spontaneous adoption) involving a community with self – defined targets with schemes ranging from an internet game to a lottery converting GHG reduction into tradable certificates;
4. An enterprise (narrow scope, mandatory adoption) where the mobility manager introduces the MCM as a way to plan actions to reduce transport impacts.

This multiplicity of possible implementation schemes has some common key features:

- Electronic GHG wallet – The GHG production (and possibly the other externalities related to mobility of persons and goods) are translated into “credits”, that will become the common “currency” to be spent within the assigned budget limits;
- Travelers’ awareness – Due to the fact that travellers will not have an unlimited number of credits, they are requested to optimize their consumptions modifying their mobility profile;
- Integration – The MCM is an umbrella concept allowing each community (municipality, social network, enterprise, etc.) to leverage the available degrees of freedom to tailor different policies both on the supply side and on the demand side, taking into account the specific constraints of each case. For instance, it allows to make visible and understandable currently overlooked alternatives like car/van sharing and park&ride options.

The need to have an electronic wallet brings from the “Mobility Credits Model” (“MCM”) to the “Mobility Credits Platform” (“MCP”), that is the technical implementation of the model requiring the use of current and future ICT.

### 1.3. Description of the main S&T results and foregrounds

#### 1.3.1 Methodology

The collaborative project DEMOCRITOS tested the MCP (Mobility Credits Platform) effectiveness for the reduction of CO<sub>2</sub> emissions and other externalities, through the simulation of four case studies (the four participating cities of Genoa, Stuttgart, Lisbon and Craiova).

The case studies have a common modelling approach, focused on integrating the existing modelling tools in the study sites (namely, transport network models) with the specific features needed to address the issue of simulating the MCP. The additional modelling work has been developed using different approaches (e.g. System Dynamics, electronic spreadsheets or databases), as chosen from each responsible partner.

Nevertheless, for simulating the MCP scheme, the design of the modelling simulation follows the approach described below:

- an independent tool - specifically developed - simulates the impact of MCP on passenger transport demand in terms of OD matrices of trips (MCP tool),
- the existing transport network model implements the output of the MCP tool (namely the matrices), estimating detailed transport and environmental results.

In other words, the modelling approach is based on developing a tool for estimating the impacts of mobility credits on transport demand in terms of OD matrices by mode, which are the inputs for running simulations with the transport network models.

The following figure shows the general approach for simulating the MCP in the case studies.

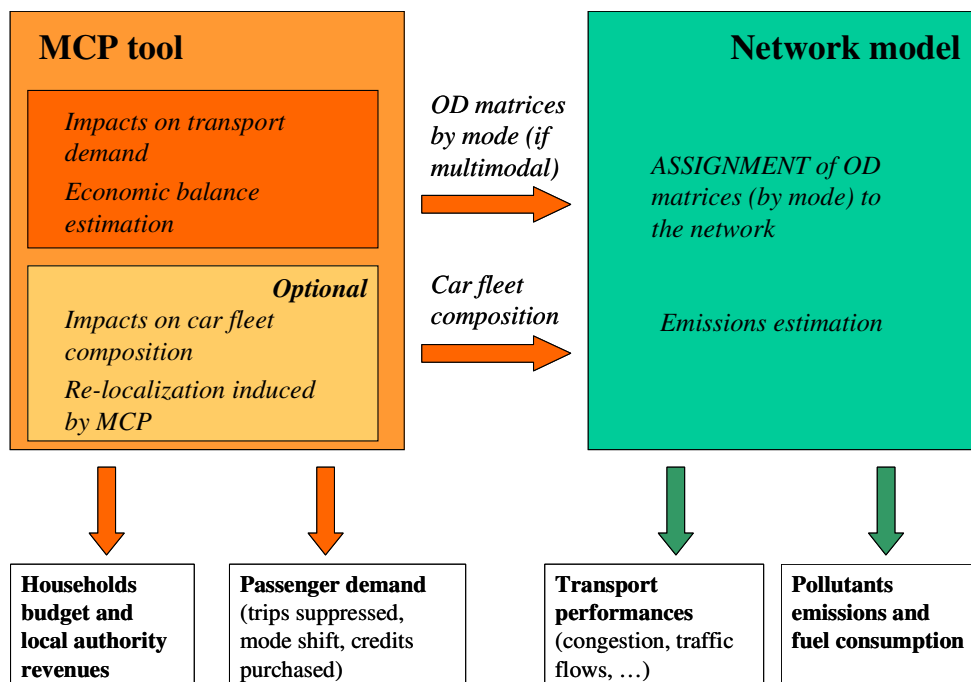


Figure 1: Design of the modelling approach for MCP local development

Each site has developed its own MCP tool, but, in the end, local tools are required to do the same things at least with reference to a minimum set of elements; additional features have been added

when of interest for the local team. Common requirements concern different aspects: segmentation of demand, leverages available to define MCP, modelling results and key assumptions concerning the MCP implementation.

### Key assumptions

Since the local MCP tools simulate a common set of scenarios and produce a set of comparable results, key assumptions have been defined in order to keep consistency and comparability among the sites: differences are the consequence of the specific initial conditions and of behavioural responses. Nevertheless, partners were free to setup a more complex model, covering aspects relevant for the case study, provided that the common approach was respected.

Common assumptions are also needed to correctly reflect the concept of MCP, with the simplifications needed for modelling purposes. Below, a set of key assumptions is listed, underlying where hypothesis could be 'smoothed' or changed (in order to fit the purposes of the specific case study) or not (for keeping the consistency and comparability among the sites).

- MCP is applied to private motorized mobility (including motorcycles where relevant in the case study).
- Credits are distributed to individuals (not vehicles) since models can simulate behavioural responses of individuals.
- The definition of the subjects for free credits distribution is consistent among the case studies. The most general of the available options have been chosen, with the distribution of credits to all adult individuals, resident in the study area (setting the threshold at the minimum car driving age, 18 years old).
- Private transport demand is segmented by population group, at least by income level (high or low), in order to distinguish reactions and to allow the analysis of differentiated financial burden.
- The budget of free credits is defined on a quarter basis. Quarters do not need to have a correspondence with actual months, i.e. base mobility of each quarter can be the same, with education, working and holiday trips represented in each quarter.
- The models are capable to simulate (under assumptions and simplifications) scenarios where credits can be purchased only as a result of trading of credits between individuals, thus only within the sustainable mobility threshold. Nevertheless, some tools could simulate scenarios where extra-credits can be purchased even beyond the estimated sustainability threshold (implicitly from a central local authority, so giving rise to public revenues).
- Rules of consumption apply for both the spending of free credits and the definition of extra-credits price: leverages related to vehicle fleet composition, quality of public transport services, distance travelled, time period of the day may be included.
- The MCP tool simulates short-term reactions: possible behavioural changes include suppressing trips, shifting trips to public transport modes, shifting trips from peak to off-peak hours or purchasing extra-credits for additional private mobility. Including long-term reactions (e.g. impacts on land use and settlements) can be a desirable feature of the tool but it is not strictly required.
- The definition of the externalities to be included for setting the Sustainable Externality Load in each scenario is common among sites as well as the approach for measuring and monitoring their impact: GHG, pollution and congestion are taken into account.



## Common scenarios definition

Policy test definition is aimed to evaluate the impact of common alternative specifications of MCP against a reference scenario, where MCP or other forms of pricing are not applied. Therefore, results are provided in terms of percentage variations with respect to the reference scenario, under the assumption that all the parameters not related to the Mobility Credits are unchanged within all the scenarios at the same time threshold.

Even if the modelling tools, once calibrated, will be available to simulate various schemes with different levels of details, a common set of scenarios is required in order to produce comparable results across the case studies. Nevertheless, additional specific scenarios built for the specific context of each case study were designed and simulated.

The common policy scenarios are built on the following elements:

- Level of Sustainable Mobility Load,
- Rules of Consumptions (e.g. focusing on emission standard or distance, etc.),
- Mobility area definition (e.g. city centre only or wide area),
- Elements for the Externality Load estimation (e.g. focusing on a specific aspect among GHG, pollutants and congestion)

*Level of Sustainable Mobility Load.* This element represents the target of each policy scenario. For the definition of the common scenarios, two levels of SML have been defined: a reduction of 20% of the Externality Load in the reference scenario (“soft reduction”) and a reduction of 50% (“strong reduction”).

*Rules of Consumptions.* For the design of the common scenarios, only leverages available in each MCP tool could be included; in addition, for sake of simplicity it has been decided to contain the level of differentiation (and consequently the amount of leverages involved). Therefore, the common scenarios are designed taking into account differentiation in terms of Euro standard of the vehicle and distance travelled. Euro standard has been taken into account in order to include an indicator of the renewal of the vehicle fleet.

*Mobility area definition.* Two different Mobility areas are defined in the common policy scenarios, identifying a restricted area (e.g. city centre) and a wide area (e.g. the whole municipality area).

*Elements for the Externality Load estimation.* Since externality load could be defined taking into account various elements, different combinations are set in order to apply the MCP focusing on a specific aspect. In the common scenarios, two possibility are simulated: a combination of congestion, GHG, air pollution and a test dealing with GHG only.

An additional assumption for the simulation of all scenarios is related to the level of Individual Free Mobility Budget: the whole Total Credit Amount related to the SML is distributed for free to the subjects. Finally, it should be taken into account that the Sustainable Mobility Load is not flexible: once the Total Amount of Credits is consumed in the area, the demand of extra-credits cannot be satisfied, i.e. new extra-credits cannot be issued and sold by local authority.

The following table summarizes the five scenarios designed for the case studies.

Scenario	Mobility area	Sustainable Externality Load	Externality Load	Rules of consumption
A1	Wide	Soft (80% of BAU Externality Load)	GHG + congestion + pollutants	Distance, Euro Standard
A2	Wide	Strong (50% of BAU Externality Load)	GHG	Distance
A3	Wide	Strong (50% of BAU Externality Load)	GHG	Euro Standard
B1	Narrow	Soft (80% of BAU Externality Load)	GHG + congestion + pollutants	Euro Standard
B2	Narrow	Strong (50% of BAU Externality Load)	GHG + congestion + pollutants	Euro Standard

**Table 1: Overview of the common policy scenarios**

### Output indicators

The combined use of the MCP tool and the transport network models should produce a set of indicators for evaluating the impacts of the Mobility Credit scheme. Local applications might need specific indicators, but for the sake of comparability a minimum set of indicators is required.

In particular, the minimum requirement consists of:

- Passenger demand: passenger-km and total trips generated by mode (and also trips suppressed, trips shifted to other modes, trips shifted by time period and trips with purchase of Extra-credits);
- Budget of households by population group (in terms of expenditure/revenues related to credits purchase/sale);
- Revenues for the local Authority (where relevant for the simulated scenario);
- Emissions related to cars (or, where possible, to all modes).

The first three indicators are provided by the MCP tool, while the last two are estimated as a results of the transport network models and/or external modules.

### 1.3.2 Overview of the modelling applications for simulating the MCP

Each local application consists of two different tools: the transport network model and the MCP tool. Transport network models represent the existing tools available for simulating on a link basis the impacts of MCP on transport demand: they have been developed within other projects and are used in the Democritos project in their current version, generally without intervention on the model structure and/or calibration.

Most of the transport network models are developed with the Visum software and simulate private traffic only (unimodal models): therefore, mode split is not taken into account within the network modelling tool. Generally, transport demand is not segmented in the network model: nevertheless, information concerning trip purpose segmentation is available in some cases (Genoa and Stuttgart). Despite transport emissions are not estimated within the network model, all case studies can provide exogenously the emission estimation (based on traffic flows by link), taking into

account average vehicle characteristics as well as speed on each specific link of the network (implicitly taking into account the congestion effect).

Almost all the local tools can provide similar outputs in terms of performances of passenger demand (average travel time, average travel cost, average distance, etc.); slightly different results are produced for the case study of Craiova, where an alternative structure has been developed for replacing the use of a network model, not available for this context.

City of	Genoa	Stuttgart	Lisbon	Craiova
<b>Transport model tool</b>				
<b>Model software</b>	Visum	Ptv visum (visum, visem)	Visum	Alternative structure
<b>Unimodal / multimodal</b>	Unimodal: private car. Extension to multimodal for Democritos, including public transport (bus and rail)	Unimodal: private traffic and freight transport. Public transport available in a separate model	Unimodal: private traffic (both private and public transport can be simulated, but in separated models)	Unimodal (cars)
<b>Base year</b>	2006	2005/2006	2004	2009
<b>Spatial level of the Zoning system</b>	330 zones (261 for the urban area of Genoa, 69 representing the Genoa Province)	1170 zones	320 zones in Lisbon, more in the Lisbon Metropolitan Area	All the city of Craiova, 109 zones
<b>Transport emission model</b>	Available, exogenous but integrated with transport model results.	Available, but exogenously estimated	Available, but separated from the transport model	Available, but exogenous
<b>Demand segmentation</b>	No (but segmentation by trip purpose available for 2001)	No (but segmentation by trip purposes available for 1995 and surveys in 2010).	No	No
<b>Time horizon</b>	2020	2005/2006	Some scenarios for 2008, 2012 and 2020	To 2014
<b>Simulation period (peak hours, day,..)</b>	Working day: morning peak hours, evening peak hours available (extension to week-end and off-peak hours for this project)	Day	Peak-hours only	Working day: Peak / Off-peak hours
<b>Demand generation</b>	No, exogenous procedure for matrix estimation	Generation model available based on 1995, updated and calibrated for 2005/6	Only an assignment model	No, Exogenous procedure for matrix estimation
<b>Mode split</b>	No, not available endogenously	Available in generation model (for 1995)	Not available (unimodal)	Not available
<b>Private vehicle cost parameters</b>	Cost per vehicle-km, cost per OD pair	Can be calculated externally to the model	OD Pair	Not available

**Table 2: Overview of transport network models characteristics**

On the other hand, local MCP tools were developed specifically for the Democritos project, with the aim of simulating the impacts of MCP in terms of behavioural changes (trips suppressed, trips shifted to other modes, etc.): results are produced in terms of OD matrices of trips.

Various software are used in the case studies (VENSIM, Microsoft Excel, Microsoft Access), while the overall amount of zones is similar (20 to 30) and always aggregated with respect to the zoning system implemented in the network models. Demand segmentation is different among MCP tools, but all of them take into account the income level, usually defined by a proxy variable (e.g. employment condition). In terms of leverages for setting the scenarios, car fleet composition and distance travelled are the common aspects available for all the cases.

MCP Tool Characteristics		Genoa	Stuttgart	Lisbon	Craiova
<b>Software</b>		VENSIM® (system dynamic)	Excel (Microsoft Access)	Anylogic	MySQL and CSharp
<b>Zoning system</b>		32 zones (330 in the network model)	About 8+1 zones (1170 zones in the network model)	52 zones (224 zones in the network model)	12 zones
<b>Demand segmentation</b>	<b>Population</b>	Yes (by zone)	Yes (by zone)	Yes (by zone)	Yes (by zone)
	<b>Trip purpose</b>	Yes (by zone)	Yes, aggregated (Commuting / non-commuting)	No	No
	<b>Income level</b>	Yes, proxy variable (by municipality)	Yes (by aggregated zones)	Yes (by aggregated zones)	Yes (By neighbourhood)
	<b>Time period of the day</b>	Yes	Yes (but not in transport model)	Yes	Yes
	<b>Quality of PT service</b>	Yes, qualitative (by zone)	No	No	Yes (By zone)
<b>Leverages</b>	<b>Car fleet composition</b>	Yes (by municipality)	Yes (by aggregated zones)	Yes (regional level)	Yes (By region)
	<b>Time period of the day</b>	Yes	Yes	Yes	Yes
	<b>Quality of PT service</b>	Yes, qualitative (by OD)	No	No	No
	<b>Distance travelled</b>	Yes	Yes	Yes	Yes
	<b>Mode</b>	Car and motorcycle	Car	Car	Car

**Table 3: Overview of MCP tool structure**

Outputs	Genoa	Stuttgart	Lisbon	Craiova
<b>Effects on car fleet composition</b>	Yes	No (external assumptions)	Yes	NO
<b>Re-localization Effects</b>	Yes	NO	Yes	NO
<b>Output of the MCP tool requested by all cases</b>	New quarterly OD matrix by mode (trips/quarter)			
	Suppressed trips (trips/quarter)			
	Trips shifted to public transport (trips/quarter)			
	Car (motorcycle) Trips purchasing credits (trips/quarter)			
	Average budget of households by Income Level (euro/quarter per person)			
	Revenues for the local Authority			
<b>Additional output from specific case</b>	Car (motorcycle) Trips shifted by time period of the day (trips/quarter) – Genoa/Lisbon			

**Table 4: Overview of MCP tool outputs**

Concerning the context of the implementation of the MCP, the four case studies present different characteristics in terms of urbanization, population and structure of mobility.

**Genoa** is the capital of the Liguria region in Italy's north-west. The city of 620,000 inhabitants is Italy's busiest port and one of the largest historical centres in Europe. Genoa is located between the sea and the mountains with a comparatively long and narrow coastline stretching from East to West. The urban landscape is defined by the topography of the area with development mainly in the coastal area that slopes down to the sea. Despite a city area of 239 square km, the urban core covers just 28 square km, accommodating 285,000 inhabitants (10,153 inhabitants/square km). Due to the lack of space and the absence of alternative routes Genoa has a very difficult street layout. Its transport system is strongly influenced by the complex topography.

In terms of mobility behaviours, data shows that 54% of the motorized trips during morning peak hour (7.30-8.30) is performed by public transport (bus and rail). In addition, it should be underlined the relevant share related to motorbikes (about 11%), noticeably larger than the average national value.

**Stuttgart** is the capital of Baden-Württemberg and town centre of one of the most important economic and agglomeration areas in Germany. The town forms, with nearly 600,000 inhabitants, the centre of the conurbation "Stuttgart Region" with 2.5 million inhabitants and 1.3 million persons employed. In Stuttgart live about 581,000 people. Daily up to 900,000 people commute to and from Stuttgart.

Public transport is an important component of the mobility concept: according to the latest survey among Stuttgart citizens for 2009, public transport is used by 42% of the surveyed to reach their place of work/education. The motorized private vehicle traffic prevails for commuter and education traffic: around 54% of the surveyed people use at least on parts of their way the car and 3% the motorcycle. Another 16% go on foot or use the bicycle to their work/education place, 13% use (at least on parts of their way) the bicycle.

**Lisbon** is the Capital of Portugal but also its most important political, administrative, economic and cultural centre. Approximately 5% of the country's population lives in the Municipality of Lisbon, however, its Metropolitan Area (LMA), which includes 18 municipalities, accounts for more than 2.8 million people,

representing more than a quarter of Portuguese population. Along the last years there was a clear trend towards urban sprawl in the LMA, with the Municipality of Lisbon and some of those bordering it being losing population to municipalities further away from the centre of Lisbon; nevertheless, Lisbon still concentrates most of the jobs in the LMA.

Such development pattern presents new challenges to the transport system in the LMA. In 2005, approximately 400,000 vehicles were entering the city in a typical working day, with most corridors experiencing very high levels of congestion. In addition to this increase in the number of commuters entering the city centre, it is also important to note that over the last few years private transport (cars and motorcycles) has become the most relevant transport mode in many areas of LMA, especially in those further away from Lisbon. According to the mobility survey for non-residents (2003/2004), 45% of commuters coming from outside Lisbon were using their private cars to get to work.

The city of **Craiova** (that has currently approximately 320,000 habitants) is the 6th largest city in Romania and is the chief commercial city west of Bucharest. The city prospered as a regional trading centre over the centuries and is in continuous development in terms of economy, infrastructure (new constructions, extension of rail road network, airport, etc.) and population (the number of inhabitants increased by about 12% over the last decade).

Craiova Municipality provides the citizen public transport with trams, buses and micro-buses, transporting 65 millions of travellers every year. It can be estimated that public transport satisfies 44% of mobility, while car mode is used for 54% of the trips.

The following table summarizes the main characteristics of the four cities.

	<b>Genoa</b>	<b>Stuttgart</b>	<b>Lisbon</b>	<b>Craiova</b>
<b>Population in the city</b>	620,000 inh.	600,000 inh.	560,000 inh.	320,000 inh.
<b>Population in the region/province</b>	880,000 inh.	2,500,000 inh.	2,500,000 inh.	730,000 inh.
<b>Daily commuters from the surrounding region</b>	50,000	900,000	500,000	80000
<b>Mode split (motorized modes only)</b>	(morning peak hour)	(Day, Region)	(Day)	(Day)
<b>Car</b>	35%	81.7%	42%	54%
<b>Motorcycle</b>	11%	0.5%	(private transport)	2%
<b>Public transport (bus, train)</b>	54%	17.8%	58%	44%

**Table 5: Overview on the case studies**

### 1.3.3 Main results

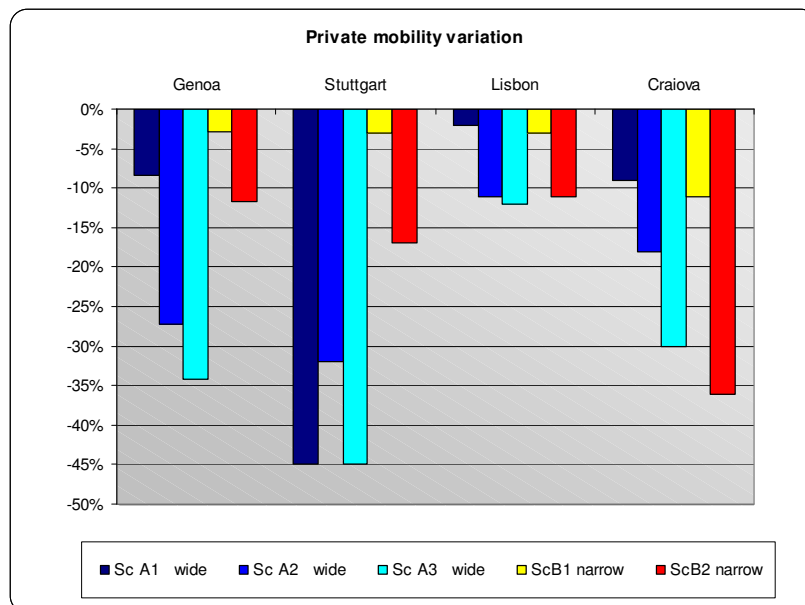
The policy scenarios have been simulated in each case study according to the common methodology agreed between the partners. Nevertheless, the local applications have been developed with different tools, according to the data availability and defining features and rules adjusted to the specific context.

As a consequence, the results of the four MCP tools are not directly comparable, unless foltering them through all the specific assumptions of each case study. Detailed results and assumptions are described in Deliverables 9 and 10.

Looking at the outputs of the run of the common policy scenarios, the following conclusions can be drawn:

- The MCP tools provide similar reactions with different levels of sensitivity, depending on the elasticity parameters set up in the model as well as on specific characteristics of the Mobility Credit Scheme (rules of consumption, nominal credit value, pricing policy and Individual Free Mobility Budget). In fact, even if the same policy scenario is applied, the set up of the specific characteristics might give rise to different results: therefore, the flexibility of the tool allows to define policies exploiting different leverages.
- The different elasticity parameters (proper of the local context) and the characteristics of the Mobility Credit Scheme give rise to different reactions of individuals among the case studies. For example in Lisbon the suppression of trips seems to be an option more selected than in the other case studies, where it represents only a residual choice.
- In all cases, scenarios applied to a narrow Mobility Area are less effective and efficient than the applications to a wide area: therefore, it seems not fruitful to try to solve a problem of a larger area by intervening through access restrictions in a smaller subset of it. The application of a wide area would also provide an increased and more perceived level of equity among the citizens.
- The implementation of a differentiation based on the Emission Standard of vehicles requires an adaptation over time of the consumption rules, in order to adequate it to the renewal of the fleet.
- The range of results obtained from the quantitative applications has estimated a shift of private demand to public transport service which might be not affordable with the existing supply. On one hand, this aspect reflects the limit of the MCP tools, which currently do not take into account the capacity constraints and frequency of public transport service. On the other hand, this result underlines the importance of the application of the MCP in combination with an improvement of public transport network as well as private-public interchange facilities, in order to provide valid alternatives for the mobility patterns of individuals.

The following figures show the results obtained in terms of private mobility and CO2 emission variation as a consequence of the Mobility credits introduction, in each city for the common scenarios tested.



**Table 6: Overview of private mobility variation in each city for the common scenarios**



The range of reduction observed in each case study is different, according to the specific assumptions and parameters implemented; nevertheless, common conclusions can be derived as mentioned above.

In addition, it should be underlined that the common scenarios tested have been defined for methodological and theoretical purposes: therefore, some of them generate quite “extreme” results. Of course, these scenarios can be used to analyse the applicability of the tool and the expected reactions, but further considerations should be taken into account for defining a real application of the MCP concept.

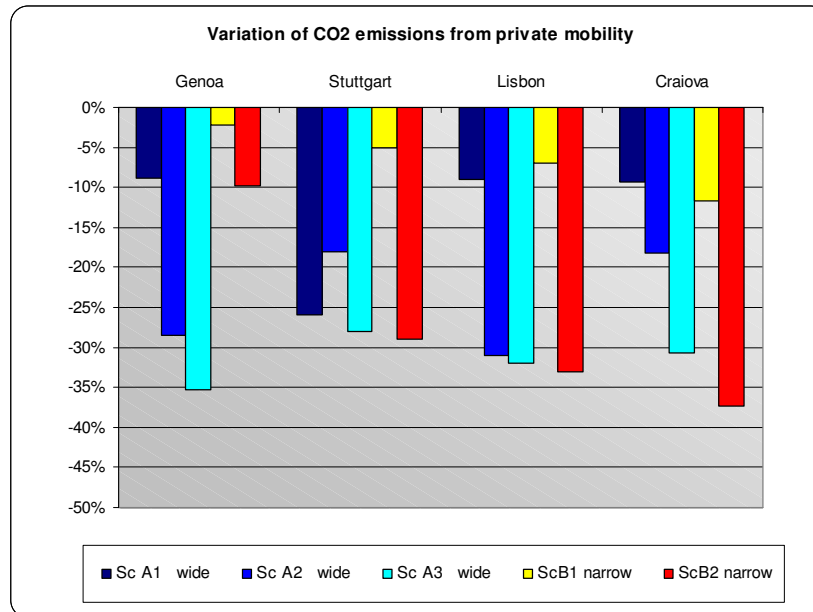


Table 7: Overview of CO2 emissions variation in each city for the common scenarios

### 1.3.4 Implementation issues

The implementation of the Mobility Credit Platform has been investigated within the DEMOCRITOS project under different aspects: beside the modelling simulation of the impacts, the assessment of the technology architecture and the issues related to acceptability and legal implications have been addressed (these latter explained in the paragraph devoted to the socio-economic impact).

With reference to the **technology benchmark**, the aim is to identify and assess the current and future technology infrastructure in each case study, in order to evaluate the prerequisites for the implementation of such a scheme. The analysis of the existing infrastructures, together with the indications of the approved development plans, allows to understand how to reduce possible implementation costs.

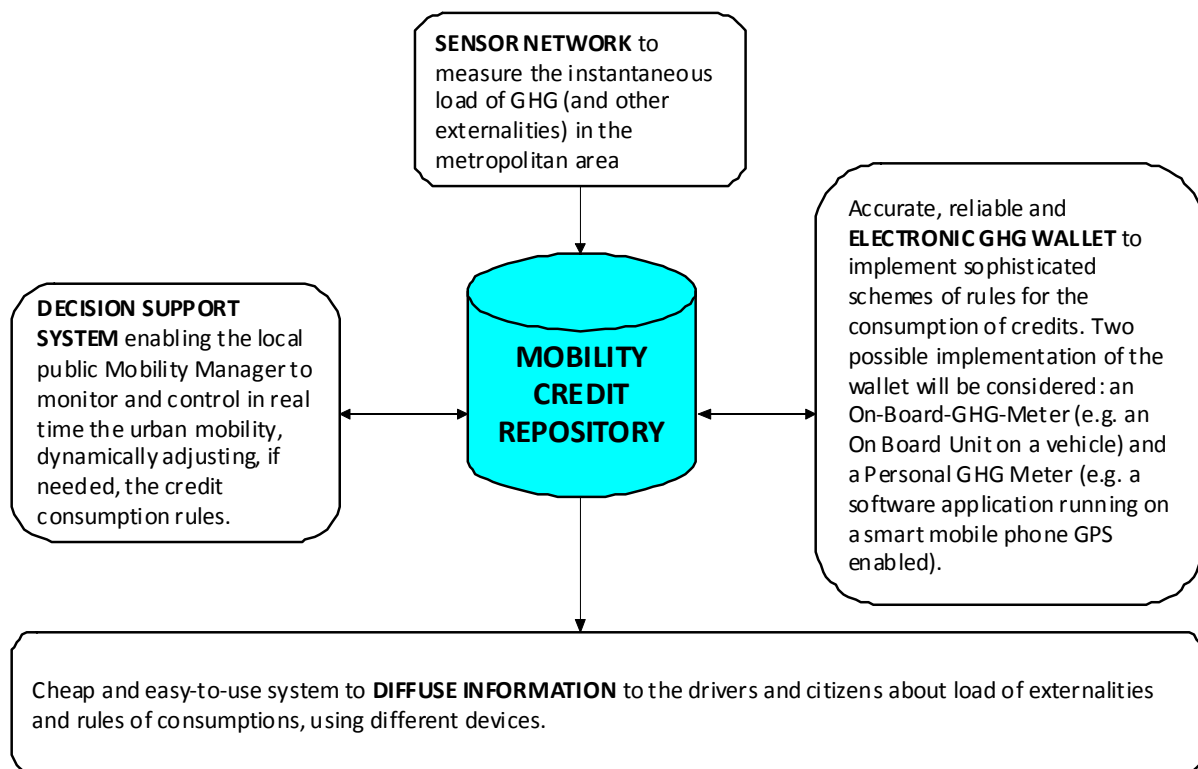
More in detail, the analysis is conducted taking into account that the organization of the collection of data and of the management of hundreds thousands accounts (the number of citizens, vans and trucks travelling in the urban area) would require an appropriate architecture carefully designed and optimized. Therefore, current technological availability in each case study is compared with the requirements of a platform designed in a modular architecture, which might allow different schemes to be implemented.

The sample platform is made of the following sub-systems:



- a **decision support system**: it is the “core” sub-system of the platform, enabling the local public Mobility Manager to monitor and control in real time the urban mobility, dynamically adjusting, if needed, all functions and parameters of MCP;
- a **sensor network** to measure the load of GHG (and other externalities) in the metropolitan area. This information is necessary to implement the strategic and tactical management of the sustainability of the urban mobility;
- an accurate, reliable **Electronic GHG Wallet** to implement sophisticated schemes of rules for the consumption of credits;
- a cheap and easy-to-use **system to diffuse information** to the drivers and citizens about load of externalities and rules of consumptions, using different devices;
- a **common repository** where to store information gathered from the field and processed by the system; this repository will act also as an interface between all MCP sub-systems.

The following figure shows the structure of the platform in its modular architecture.



**Figure 2: Overview on the platform for the technological implementation of the MCP**

For each case study, the information related to each of the above modules has been collected and classified in order to evaluate:

- the **current status**: referring to the availability and/or the timing for the availability;
- the **physical location** of the data (if not in electronic form);
- the **server location** where data are stored: in terms of both the physical location and its network address (IP, DNS, etc.);
- the **owner** of the data: including details on public or private entity;

- the **technical conditions** of the data: the formats, availability, version, frequency of update, etc.;
- the **economic conditions**: the terms and conditions of use negotiated with the Owner;
- the existing **constraints**: if any, related to the use of data, legal issues, obligation regarding the network connections (i.e. data security), security clearance needed by personnel, etc.

Information has been classified in tabular format, covering the characteristics mentioned above.

In general terms, the analysis for the city of Genoa shows that all main technologies are already available to implement the MCP. In particular:

- the elements for the Decision Support System are available (in terms of geo-referenced data, databases with information on subjects and vehicles and traffic simulator);
- the sensor network is available as well, and the networks of congestion and pollution sensors, telecommunications and vehicles identification are interconnected through a traffic supervisor which will be updated in the near future;
- electronic payment systems are available, while electronic money wallet systems are not currently available. Smartphone technology may be an alternative option for the application the system: in Genoa the penetration is currently under 10% but is growing very fast;
- info-mobility web sites for information diffusion are available;
- a Mobility credit repository is not available, but ICT technologies currently available can help implementing it in a relatively easy way.

The assessment of the available technologies for an MCP implementation in Stuttgart shows the following main results:

- The elements for the Decision Support System (cartography, various databases on citizens, businesses and vehicles, traffic simulators, emission models, geo-referenced data on mobility) are available;
- The sensor network is available, in particular the networks of congestion and pollution sensors. Vehicle identification is currently not possible in Stuttgart, but corresponding tests are already running in the city of Stuttgart. The communication network in the city (fibre optic cable network) for traffic monitoring by video cameras may be used or even extended for ANPR technology by video; the network is quite dense and is being extended successively.
- Electronic payment systems are available for some applications (parking, foreseen for public transport tickets in near future), while electronic money wallet systems are not available up to now. The Smartphone penetration is currently 11% in Germany and is expected to rapidly grow up to 22% in 2012 already.
- Call centres and info-mobility web sites are available;
- A mobility credit repository is not available, by definition, but ICT technologies currently available can help implementing it in a relatively easy way.

With reference to the case study of Lisbon the analysis shows that all main technologies are already available to implement the MCP. In particular:

- the key elements for the Decision Support System are available, but might be spread amongst

different organisations; a major improvement is expected with the establishment of the Mobility Observatory of Lisbon, a project which aims to implement a platform that combines geographic information of all elements of urban mobility;

- sensor network: in general a network of sensors that allow real-time monitoring of traffic conditions, weather and air pollution levels is available in Lisbon;
- electronic payment systems are available, as numerous fleets and private vehicles are currently equipped with OBU applying the system 'via verde';
- info-mobility web sites for information diffusion are not widespread but some structures already exist;
- a Mobility credit repository is not available, but ICT technologies currently available can help implementing it in a relatively easy way.

Finally, in the test case of Craiova the following technical barriers should be overcome for the implementation of MCP:

- There are only some components of the Decision Support System, those providing input data into the system. Existing structures can provide necessary data, updated periodically. Traffic simulator is not available.
- The sensors systems in Craiova consist of independent components not interconnected and integrated into one unitary system. Traffic Supervisor covers partially the city and will be extended in the future. Some information required for the MCP application are not available in Craiova: parking management, floating car data and accidents management
- Generally, telecommunications and vehicles identification are not well represented in Craiova. Telecommunications infrastructure is available and has a wide coverage but the vehicles identification system is missing.
- Electronic wallet is not available, is a cost effective component both for owner of fleets or vehicles and for individual owners of cars and the system is not easily and soon accessible. Smart phones are still a limited solution due to the high costs.
- Information diffusion components have a poor representation in the city, only Info-mobility points placed in key points in the city are available.
- The Mobility Credits Repository is not available and even the technology provides the necessary equipments the technical solutions cannot be applied on large scale due to the high costs.

The following tables give an overview on the technology benchmark in each case study.

Technology	Genoa	Stuttgart	Lisbon	Craiova
<b>Decision Support System</b>				
Map server containing geo-referenced data of the Mobility Area	Available	Available	Available	Available
Database with information on the vehicles composition of the Mobility Area	Available	Available	Potentially available with the Mobility Observatory	Available
Database with information on Subjects (citizens, vehicles, businesses, transporters, etc.)	Available	Available	Not available	Available
Traffic simulator	Available	Available	Available	Not available
Database from insurances, hospitals, local statistics, ...	Available	Not available	Not available	Not available
<b>Sensor network</b>				
Traffic Supervisor	Available	Available	Available	Available
Parking management	Available within 12 months	Available	Available	Available
ZTL access control	Available	Not available	Available (some zones within the city centre)	Available
Traffic measurements / speed sensors	Available	Available	Available	Not available
GHG sensors	Not Available	Available	Not Available	Available
Particulate, NOx, SOx sensors	Available)	Available	Available	Available
ALPR Vehicles identification	Available	Not available	Available	Not available
Metropolitan and urban fiber networks	Available	Available	Available	Available
Mobile Operators	Available	Available	Available	Available

**Table 8: Overview of the technology benchmark on DSS and sensor networks**

Technology	Genoa	Stuttgart	Lisbon	Craiova
<b>Electronic GHG Wallet</b>				
Fleets already equipped with OBUs	Available (approx. 2,000 vehicles, Taxis, Emergency Services, Car sharing)	Not available (except for TollCollect System EFC >12t on motorways/few nat. road sections)	Available	Not available
Private vehicles already equipped with OBUs	Available (Octo Telematics, approx. 6,500 vehicles)	Not available (except for ) Co-pilot system for private cars by Spar-kassenversicherung (started 4/2011)	Available	Not available
Smartphone equipped with GPS receiver	Penetration estimated in 8%, (fast growth expected)	Available (fast growth, penetration expected for 2012: 22%)	Available (penetration share not estimated)	Available
Electronic payment systems	Available	Available for parking (planned for PT e-ticket)	Available	Not available
<b>Information diffusion</b>				
Call centres	Not Available	Not available	Not available	Not available
Info-mobility web sites	Available	Available	Available but not widespread	Not available
Info-mobility points	Not Available	Available	Available but not widespread	Available
<b>Mobility Credit Repository</b>				
Public Transport routes and schedules	Available	Available	Available	Available
GIS map of the Public Transport network	Available	Available	Potentially available with the Mobility Observatory	Not Available

**Table 9: Overview of the technology benchmark on Electronic GHG Wallet, information diffusion and Mobility Credit Repository**

### 1.3.5 Recommendations for MCP application

The concept and the application of the Mobility Credit scheme have been investigated within the DEMOCRITOS project in four cities with different mobility patterns and local context conditions. Furthermore, different simulation tools have been developed, according to the data availability and defining features and rules adjusted to the specific context. As a consequence, the results of the

four case studies may provide different indications, partially related to the specific local assumptions. Nevertheless, common recommendations may be derived from the combined experience of the four cities, as reported in the following paragraph.

The mobility credit instrument theoretically allows being as efficient in internalizing urban mobility costs as simpler pricing systems. However, at the same time it provides decision makers with additional tools to deal with public acceptability and social consequences (equity), which are core issues for implementation of pricing solutions, as recognized in the Commission's Action Plan on Urban Mobility<sup>1</sup>.

Case study results in Democritos suggest that the concept of mobility credits may have a better ability to communicate to citizens the reasons and benefits of such a restrictions (or rather permissions) policy than conventional pricing policies. Key factors are the notion of limits to social costs within the urban area and the fact that the measure is not perceived as another way to draw additional public funds. The general tenor should basically be to convince users and citizens of being part of an overall sustainable urban concept, instead of urging or penalizing them for private car use. For this reason incentives and awards play an important role and should be strengthened.

As negative points, the mobility credits approach does not enable to fully collect cost internalization payments into the public budget – which in some cities may be a political driver to implement road pricing schemes – and it implies some additional administration costs related to the allocation and accounting of credits to users.

The issue of Climate Change does not justify, on its own, the use of a credit-based system. As concluded in the study on Internalisation Measures and Policies for All external Cost of Transport (IMPACT)<sup>2</sup> of the EC, for internalisation purposes of greenhouses gases (GHG), the estimated external costs are most effectively factored into the price of transport fuels on the basis of their respective GHG contents, i.e. through fuel taxation. In fact, the given and common cost figures for CO<sub>2</sub> emissions lead only to very low additional costs in case of internalisation of emission costs through a pricing scheme. Therefore, using mobility credits or other urban level internalisation instruments to address climate change costs should only be applied as a second-best case, if for a reason it were not possible to do it through fuel taxation.

However, like for urban mobility pricing, the case for mobility credits stands for the internalization of congestion, air pollution or other local external costs. Given that congestion is – according to state of the art cost valuation techniques, as set out in IMPACT – by far the most important source of costs, the advantages of its application are greater in cities where congestion is a bigger problem, particularly large and dense cities. This type of cities also feature higher exposure levels to air pollution. It may therefore be concluded that the efficiency gains of mobility credits (or road pricing) are particularly important in large and dense cities. As a result, it should be clearly stated that the MCP should not be implemented as a stand-alone policy: in order to be effective, the scheme has to be applied in a wide context of mobility measures to promote sustainable transport modes, reducing private car usage and thus mainly congestion. A crucial role of the overall approach is played by the supply of public transport services and private-public interchange facilities, in order to provide valid alternatives for the mobility patterns of individuals.

Given the potential advantages of mobility credits in relation to pricing systems, we recommend the Commission to incorporate the possibility of credit systems in the establishment of a common framework (methodological and technological) for internalization of external costs in urban areas. In the same way, the mobility credits option should be included in information exchange activities among experts and policy-makers facilitated by the Commission, as planned in the Action Plan for Urban Mobility.

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<sup>1</sup> COM(2009) 490

<sup>2</sup> Handbook on estimation of external cost in the transport sector, 2007, Maibach *et al.*

From an efficiency point of view, the rules of credit consumption will not entail significant differences to any conclusions drawn for simple pricing systems at the urban level. Any lessons taken towards pricing rules are directly applicable to mobility credits schemes and do not need to be fully reassessed. Actually, as mentioned above, similar or improved results in terms of transport and environmental performances can be achieved with respect to pure road pricing, ensuring increased equity and acceptability.

A main constraint for the MCP approach might be, however, the capacity reserves of public transport which could represent an upper threshold of car passengers motivated to use public transport. As an example, for Stuttgart (and the Region) the investigations of existing reserves and possible enlargements of capacity of public transport showed that within the next 15 years (i.e. long term) at the maximum 25% more passengers can be handled by public transport, already including additional trains and partly longer trains, more buses and few enlargements in the public transport network. Therefore the setup of the MCP policy should take into account the estimation of the shift of private demand to public transport service which can be affordable with the existing (or planned) supply.

The application of the MCP concept is optimized when applied to a wide area. With this purpose, it is suggested to avoid costly road-side infrastructure, communication infrastructure and to focus on emerging technological solution such as on-board units (already on the market for pay-per-use insurance and the E-Call directive of the European Parliament) or proper application for smartphones, having a high penetration potential. In fact, current and emerging technologies allow to design complex application with affordable implementation cost.

Of course, in this context, a clear legal framework and the handling of privacy issues are most relevant basic conditions for introducing any mobility credits-based approach.

From a more technical point of view, the definition of the leverages (rules) for credit consumption should follow a careful analysis of the structure of mobility in the specific local context, in order to obtain a reasonable response from the users involved in the MCP. In particular, when including a differentiation based on car emissions standard the local authority should be aware of its evolution over time: in fact, the renewal of the fleet might modify the original set up of the MCP parameters and a re-definition might be needed.

In addition, the analysis and selection of the leverages (rules) for credit consumption should be made according to the technology available in the specific local context. As an example, if access control is implemented a distance-related rule cannot be applied. The definition of the Mobility Area depends again on the technology selected: in some cases a wide Area (e.g. the Municipality area) can be taken into account, while for other cases a neatly limited area has to be defined (where the access control only is available).

In terms of acceptability, the recommendation of stakeholders and experts underlined that the approach must be simple, transparent and easy to understand. In fact, the complexity of the Mobility Credit concept might discourage the local authority to support its implementation, because users might be confused and have the feeling of a “black box” policy. Therefore, simple and clear elements for the communication with the users should be identified, in order to provide an understandable picture of the tool. Nevertheless, the focus should be mainly on simplifying the communication, not necessarily the tool itself.

In any case, the analysis of the general acceptability of the MCP scheme indicates that policy makers should expect a high level of initial opposition or at least uncertainty to any measure that might be seen as an extra burden on car drivers. However, the figure might be changed through a higher level of understanding of the general benefits of the policy. Accordingly, a strong communication campaign that allows a better understanding of the scheme but also clearly spots its differences to traditional pricing alternatives should be put in place from the onset.

As well as for the reasons explained above, to increase acceptability, complementary measures



should accompany the MCP implementation: e.g. improved public transport, better Park and Ride facilities.

Finally, another recommendation might result from the acceptability analysis with reference to the timing and process of introduction of the MCP (e.g. in Lisbon). Given the system's inherent complexity and the increased acceptability with the understanding of the way MCP operates, a phase-in approach from smaller local MCP schemes might be desirable. In addition respondents clearly questioned the implementation of the scheme in areas / periods with bad public transport services (e.g. during the night) suggesting that initial approaches might benefit from focusing on weekday operations in areas with good public transport coverage.

Urban mobility credits schemes do not appear to interfere with EU legislation. The rules set out in the 'Eurovignette Directive' could limit Member State action, but it only covers heavy duty vehicles and cities are fully exempted from compliance, based on the principle of subsidiarity. The principles of non-discrimination should be fully accommodated in the free credit allocation rules. Like road pricing, it is possible to avoid constraints related with privacy issues.

Due to general long-term impacts of urban access regulation policies, but also given the particular ability of mobility credits to influence location decisions and the equity framework, through the rules of free credits allocation to citizens and organizations, this policy may be used to influence urban developments on sustainable ways. Indeed, if properly designed, it may be an additional instrument to address the objectives of the Commission to promote a better integration of mobility and "healthy environments, land use planning, housing, social aspects of accessibility and mobility as well as industrial policy"<sup>3</sup>.

In summary DEMOCRITOS research has shown mobility credits as a powerful tool to address urban mobility. It does have advantages and disadvantages compared to other instruments. The recently publish White Paper on Transport Policy<sup>4</sup> puts forward several challenges that need to be addressed at urban level, even acknowledging that the subsidiary principle does limit the possibilities for EU action at such level. Accordingly, exploring new policy instruments and opening up new opportunities for local authorities to address the challenges of transport policy and exchanging experiences between countries and cities is a potentially important contribution from the European level towards the local instances that should be further explored.

In brief, the following requirements are needed for the application of the MCM:

- in terms of socio-political acceptability:
  - strong political support and will
  - high level of "mobility culture" in the involved actors
  - effective communication toward citizens with a simple, transparent and easily understandable approach integration with all the other actions on urban mobility and Public Transport improvement
  - careful evaluation of privacy issues and personal data protection
- in terms of technical issues:
  - Decision Support System, enabling monitoring and control in real time of the urban mobility and dynamically adjusting, if needed, all functions and parameters of MCM;
  - Sensor Network to measure the needed parameters to calculate the load of GHG (and other externalities) in the metropolitan area

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<sup>3</sup> COM(2009) 490

<sup>4</sup> COM (2011) 144



- An accurate, reliable Electronic GHG Wallet to implement sophisticated schemes of rules for the consumption of credits;
- A cheap and easy-to-use system to diffuse information to the drivers and citizens, about the load of externalities and rules of consumptions, using different devices (e.g. smart phones, internet, info-kiosk, etc.);
- Common Repository to store information gathered from the field and processed by the system.

Strength	Weakness	Recommendations
<ul style="list-style-type: none"> <li>• Reduced congestion in the city</li> <li>• Reduction of local air pollution and noise in the city</li> <li>• Increased equity and acceptability with respect to pure road pricing ('permission' instead of 'restriction', ensuring the right of mobility)</li> <li>• Flexibility of the tool (alternative leverages to reach the target reduction)</li> <li>• Affordable implementation cost with current and emerging technologies</li> <li>• Rational use of land (parking time reduction, stress reduction)</li> <li>• Raising social awareness in the citizens</li> </ul>	<ul style="list-style-type: none"> <li>• High complexity of the scheme</li> <li>• Second-best solution for issues related to GHG reduction (fuel taxation still foreseen as best solution)</li> <li>• Do not enable to fully collect cost internalization payments into the public budget</li> </ul>	<ul style="list-style-type: none"> <li>• Application in a wide context of mobility measures to promote sustainable transport modes</li> <li>• Improvement of public transport service supply</li> <li>• Communication strategies and simplification of the concept to make it understandable to the users</li> <li>• Application to a wide area, supported by emerging technological solution (e.g. on-board units and Smartphone applications)</li> <li>• Careful evaluation of privacy issues and personal data protection</li> <li>• Phase-in approach from smaller local MCP schemes to the full-operating scheme (given the increased acceptability with the understanding of the way MCP operates)</li> </ul>

**Table 10: Overview of the strength, weakness and recommendations for the application of the MCM**

### Recommendations on long term effects and policy design

When deciding whether to introduce credits policy (or another demand management policy) it is recommendable to consider the long-term effects of the policy, or otherwise the policy benefits will be underestimated, and possible risks overlooked. Moreover, when considering the possible ways of application of credits policy, the policy maker will be faced with trade-offs between different objectives – possibly between environment/accessibility and local development, and surely between short-term and long-term achievements. Compromises between the two later objectives may be required, especially if the viability of the policy implementation is constrained to the satisfaction of short-term objectives (e.g. for acceptability reasons). Obviously, for adequate policy design, it is necessary to clearly define and prioritize objectives and restrictions.

Mobility credits policy can be used not only to achieve desirable behaviour in terms of daily mobility choices, but it can be more ambitious by being a driver of desirable long-term structural changes in the mobility system – including urban sprawl, vehicle choices, public transport supply, technological innovation, or even travellers' beliefs. This chance of catalysing desirable long-term

changes in the system may be referenced to the notion of *worse before better* policy, as opposed to *better before worse* policy. The modelling experiments performed here indeed suggest that *worse before better* policy is the best option from a global long-term welfare perspective, when the achievement of the proposed objectives benefits from long-term system changes. If catalysing long-term structural system changes is to be a policy goal, then, in the long-run, after having obtained an ideal setting of structural features, policy may be scaled back again to simple short-term allocative efficiency (or what other goals may be).

In order to maximize benefits of policy, it is recommendable to anticipate any of those structural changes in the system even before policy is actually implemented, which allows travellers face lower short-term adaptation costs from an early stage of policy implementation. A simple and costless way to do this is by providing information to agents beforehand. Another way to anticipate long-term structural system changes is through early investments on infrastructure. For example, the benefits of the so called *Mohring effect* whereby public transport quality is catalyzed by demand increases and vice-versa, can be brought to an earlier stage if investments in public transport quality are performed in advance of demand increases resultant from credits policy.

Local context aspects should be regarded at policy making level, because it influences expected policy outcomes and optimal policy design. Furthermore, because of the existence of some uncertainty on the actual effects of credits policy, monitoring of results and regular adjustment of policy design should be common practise, also because structural changes that occur with time alter the cost-benefit framework of the mobility system.

The very undesirable effect of rent seeking could be possibly mitigated by awarding credits in some way proportionally to the actual use of credits in previous periods, or by applying non-tradable credits policy. However, these approaches would partly distort the incentives intended by credits policy. Particularly, non-tradable credits policy could introduce long-term changes in an unbalanced way and affect different segments of demand radically differently, with implications for local development and economic efficiency.

Finally, it should be bear in mind that policies designed to softening the burden of credits policy to specific segments of the population – like softer credit consumption rules for segments of demand with poor alternatives to car – may be desirable in the short-term due to fairness concerns but negative in the long-term due to elimination of incentives to make adequate long-term choices (like residential location close to public transport). In this way, MCP design strategies to cope with fairness and equity concerns will inevitably face a trade-off with efficiency of the incentives put on the demand.

At the European level, involvement of EU institutions in the wide development of the policy will be important essentially for standardization and interoperability issues.

## Roadmap for MCP application

This paragraph provides a roadmap for the application of the Mobility Credit Model, based on the experience of the qualitative and quantitative analysis carried out in each case study of the DEMOCRITOS project and taking into account the definition of possible real scale applications.

First of all, the implementation of the MCM requires a structured **analysis of the mobility patterns and the externality issues** in the area of interest. In fact, it is important to know in advance the basis on which the policy might be designed (e.g. high level of congestion due to excessive car use) and the possible target to be achieved in terms of externality reduction.

In addition, a careful estimation of the **potential capacity reserves of public transport** should be

made, in order to have in mind the maximum shift of private demand affordable with the existing (or planned) supply.

As a second step, it should be investigated which **technologies** are available in the area, having in mind that OBU and smartphone seem to be the most suitable applications based on the DEMOCRITOS experience. Another option might be the access control with plate identification, but the restrictions related to the choice of this approach seem to make it not attractive for the MCP applications. On the other hand, it should be clear that the design of the application strictly depends on the technology chosen.

Then, **privacy issues and personal data protection** have to be investigated carefully in the context of application. Laws and perceptions might be different from Country to Country, but these aspects seem to play a relevant role for the acceptance of individuals based on the DEMOCRITOS experience.

The following step is more widely related to **acceptability and communication**: it is suggested to investigate through surveys and interviews the possible reactions of individuals and stakeholders, in order to set up the basis of a profitable start-up process. In addition, it might provide some elements to estimate the potential effectiveness of the policy.

Finally, based on the analysis resulting from the preceding steps, the **design of the MCP** application can be defined.

The following details should be included and defined:

- the **area of implementation**
- the **individuals involved** in the MCP
- the **technology suitable** for the application in the specific context
- the **rules for distribution and consumption** of mobility credits
- the workplan for the implementation, including details on the test phase and the possible future extensions. An estimation of constraints, costs and time should also be made;
- the plan to **monitor the effectiveness** of the policy, in terms of mobility pattern and externality load changes.

## 1.4 Potential impact, main dissemination activities and exploitation of results

### 1.4.1 Potential impact

The potential impact of MCP have been analysed during the project lifetime, mainly through the long-term effects analysis, the appraisal of socio-political and acceptance issues, the extrapolation of some economic impact indicators.

The **effects of MCP in the long-run** are in some aspects clear and in others not so obvious and probably considerably variable from place to place. They depend on the objectives actually sought by the policy, on its design and on local context. Furthermore, effects are subject to reasonable uncertainty.

The effects of credits policy on the environment and on accessibility – or the efforts required to travellers to achieve the given targets – clearly meet their best outcome in the long-term, because there are important decisions of the travellers that meet the objectives in question which can only be fulfilled in the long-term. In the short-term, the ability of travellers to meet imposed targets is limited to short-term mobility choice decisions, whereas in the long-term decisions like car purchasing, residential and activity location or public transport investments can be made. For this reason, social cost reduction targets will be met by travellers with less adaptation efforts some time after the policy introduction (or the public publicity of its introduction).

Effects on local development are not straightforward. They may be negative or positive, depending on many and not entirely known interactions, on the definition of local development itself, and on local context including competition of the area in cause with other urban areas. However, model simulations and the literature suggest that any changes on local development derived from credits policy should be of minor importance. Moreover, they only have room until competitor areas do not have their own mobility management policies in practise, which in the long-run may be widespread practise.

Effects on equity will be positive, since high private transport mobility users tend to belong to the group of the most affluent. However, although public perceptions may be that credits policy is better for equity than policies like infrastructure pricing, theoretically there are no reasons to assume this.

There are also risks of undesirable effects. The most stringent one is rent seeking, i.e. the entry in the population entitled to free credits of individuals running their life and activities somewhere else, and still benefiting from the sales of their owned credits. Another risk is the possible asymmetric impacts on different segments of the population – depending on the physical distribution and mode choices of the population per income level – with possible negative consequences on social fairness and local development.

The effects of mobility credits policy depend on local context. Factors like the behaviour of travellers, the type and quality of the public transport system, the presence of other demand management policies, competition with other areas, or legal or physical aspects like restrictions to building development are areas which influence the optimal design and the level of benefits achieved by credits policy in the long-term.

Finally, it should be mentioned that long-term effects of MCP are theoretically similar to effects of infrastructure use pricing (if designed with similar objectives). This is a logical consequence of the fact that the proposal of credits policy historically came as an alternative to the use of simple

infrastructure pricing – for reasons of public and political acceptability – so they share objectives and consequently also most of the generated effects. There are, however, slight differences expected in terms of effects. Apart from issues related to the definition of the population entitled to credits (generating effects like rent seeking), credits policy plausibly generates different effects in relation to pure pricing strategies in terms of traveller behaviour – due to psychological effects of managing credits instead of money – attractiveness and, precisely, acceptability – due to public perceptions on redistribution of money.

The **assessment of social and political issues** of the application of the MCP is crucial to provide a comprehensive picture of the results. Since this part of the work is mainly qualitative, the outcome of the analysis consists in a series of guidelines for the interpretation of the empirical survey (where available), for addressing and solving any identified issue (e.g. privacy concerns) and for suggesting actions that would be necessary in order to overcome possible obstacles (e.g. enforcement laws).

Each case study developed a series of activities according to the specific context, in particular:

- Performing a stakeholder analysis for monitoring and evaluating critical issues, identifying the major stakeholders and setting up structured interviews and meetings.
- Performing an acceptability analysis, alongside the different interactions with citizens during focus groups and/or in telephone interviews.

City of Genoa	Main issues	Suggestions
<b>Stakeholder analysis</b>	<ul style="list-style-type: none"> <li>- positive attitude towards the MCM</li> <li>- possibility of raising awareness in the citizens</li> <li>- importance of the PT offer and private-public interchange facilities: critical point if inadequate;</li> <li>- possible social unfairness (related to the inequality of the starting conditions)</li> <li>- decrease of mobility can be seen as a reduction in quality of life</li> <li>- high complexity of the system</li> </ul>	<ul style="list-style-type: none"> <li>- incentives and awards to virtuous people must be strengthened</li> <li>- integration of MCP with all the other actions on urban mobility;</li> <li>- educational scopes and work on the cultural background;</li> </ul>
<b>Acceptability analysis</b>	<ul style="list-style-type: none"> <li>- sample composed mainly by frequent PT users</li> <li>- high level of awareness of environmental issues</li> <li>- traffic bans and Incentives (MCP) more appreciated than increase in parking tariffs</li> <li>- improvement of PT very appreciated</li> <li>- half of sample of private mode users would accept to install an OBU</li> </ul>	<ul style="list-style-type: none"> <li>- integration of MCP with PT improvement;</li> <li>- incentives to support the installation of OBU for MCP (but no major resistance)</li> </ul>

**Table 11: Overview of the social assessment in the case study of Genoa**

City of Stuttgart	Main issues	Suggestions
<b>Stakeholder analysis</b>	<ul style="list-style-type: none"> <li>- Legal issues seen as one of the fundamental pre-conditions for implementing any kind of urban charging systems in Germany</li> <li>- Viability of the MCP approach questioned since                             <ul style="list-style-type: none"> <li>▪ GHG discussion in transport will loose relevance in future due to advanced automobile technology (lower consumption/higher share of hybrid/e-vehicles)</li> <li>▪ The model is rather complex/complicated</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Integration of MCP approach with an overall concept on sustainable urban mobility;</li> <li>- Approach must be simple, transparent and easily understandable</li> </ul>
<b>Acceptability analysis</b>	<ul style="list-style-type: none"> <li>- Infrastructure costs should be included in the internalization of mobility costs.</li> <li>- High level of awareness of environmental issues</li> <li>- Improvement of PT and intermodal connections seen as very important</li> <li>- Capacity constraints of PT seen as critical point</li> <li>- High complexity of the system (too complicated and/or not precise enough (zoning, distances etc.))</li> <li>- Emission-class, distance and use of unused mobility points for other mobility purposes seen as very important factors for such a concept</li> <li>- General support of measures to reduce traffic (in terms of environmental relief) quite high among surveyed (more than 70%), about 50% would support the MCP model (if improved)</li> </ul>	<ul style="list-style-type: none"> <li>- Integration of MCP into an overall urban concept covering transport/mobility but also all other areas of life (energy, waste etc).</li> <li>- Improvement of PT and intermodal connections</li> <li>- General tenor should be to convince (non-) clients instead of urging or "penalizing" them</li> <li>- Incentives and awards must be strengthened</li> <li>- Aspect of GHG will loose in importance due to technical advance</li> <li>- Easily understandable approach needed</li> <li>- Possibility to use unused mobility points for PT</li> </ul>

**Table 12: Overview of the social assessment in the case study of Stuttgart**

City of Lisbon	Main issues	Suggestions
<b>Stakeholder analysis</b>	<ul style="list-style-type: none"> <li>- Lack of understanding of the concept / complexity of the system</li> <li>- Positive approach towards the MCM</li> <li>- Drivers already feel subject to many restrictions</li> </ul>	<ul style="list-style-type: none"> <li>- To make a big investment in communication</li> <li>- To start with small scale projects</li> <li>- To promote a smart use of revenues</li> </ul>
<b>Acceptability analysis</b>	<ul style="list-style-type: none"> <li>- Initial opposition, as system is interpreted as an urban toll</li> <li>- More support as people understand the difference from MCP to road charging</li> <li>- Need to improve PT and earmark revenues</li> </ul>	<ul style="list-style-type: none"> <li>- To make particular arrangements for some user groups (e.g. residents)</li> <li>- To improve PT ahead of any implementation and offer park and ride facilities</li> </ul>

**Table 13: Overview of the social assessment in the case study of Lisbon**



City of Craiova	Main issues	Suggestions
<b>Stakeholder analysis</b>	<ul style="list-style-type: none"> <li>- great inertia toward new methods involving changes in daily life or involving public acceptance</li> <li>- MCM is an incentive model at personal level but involves a great effort to persuade citizens on the long-term usefulness and benefits</li> <li>- great sensitivity in terms of restrictions, irrespective of their nature and whatever benefits they could bring</li> <li>- concerns on the correctness (upright) of the system, on disruption of everyday life of citizen and on use of revenues from the MCP</li> </ul>	<ul style="list-style-type: none"> <li>- start solution with small-scale application but will create injustice (applied only to a limited segment of travellers)</li> <li>- wide deployment of the system would encounter considerable public resistance</li> <li>- MCM must inspire trust, be transparent and the users must be informed on the criteria used in the computing system</li> </ul>
<b>Acceptability analysis</b>	<ul style="list-style-type: none"> <li>- questionnaires sent to around 900 persons: only 51 persons provided filled questionnaires</li> <li>- High implementation costs, involving financial efforts from the municipality to carry out the system and from the citizens or companies who must install the necessary onboard devices on their own cars</li> </ul>	<ul style="list-style-type: none"> <li>- acceptable solution in Craiova, citizens ready to accept regulations that optimize the traffic in the city</li> <li>- the real impact could be much higher and citizens have to be well prepared and informed before implementation of the system</li> <li>- extensive social survey required to assess citizens' options and familiarize the citizens with the new concept</li> </ul>

**Table 14: Overview of the social assessment in the case study of Craiova**

Finally, the **economic indicators** derived from the case studies express the economic impact of the MCP application from the individuals point of view (expenditure for purchasing additional credits) and for the local authority (revenues from the distribution of additional credits).

The results, described in detail in Deliverable 10, are very different due to the deep differences of approach in the case studies are not directly comparable. In general, significant revenues can be obtained by local authorities; the average expenditure per quarter for the single citizen can vary from some dozens of euro per quarter to even negative values, i.e. a revenue for the citizen who sells the credits that he doesn't need.

It is important to outline that the application of the MCP can be modulated according to the political objectives, including the choice of the social impact. It's possible to select, at a strategic and political level, the objectives for MCP application (for example a certain reduction of CO2 emissions from urban mobility, of private trips reduction, of public transport passengers increase, of congestion hours on the main roads, ...) and the constraints (for example a certain amount of revenues, or even no revenues, for the local authority; a maximum expenditure per citizen; ...) and, consequently, adapt the structure of the MCP.

### 1.4.2 Main dissemination activities

Since the beginning of the project, a dissemination and exploitation plan for the project results has been developed.

The dissemination plan developed followed in a larger approach a methodology of “top-down” – “bottom-up” type. DEMOCRITOS is a strategically important project for the cities involved, as well as for their local partnerships, and for the European Commission. Therefore, in order to ensure a high level of efficiency and effectiveness of dissemination actions in the top-down approach of our dissemination strategy, we defined what we want, what are our expectations, and we decided that our target is to have visibility by projecting a positive overall image of the project and to produce a high amount of awareness in terms of concept and method developed in the project. Once the target was fixed, we were able to establish the elements and steps, through which we can achieve the proposed target.

We can talk equally about a bottom-up approach if we refer to the reverse process, the feedback we received from outside and that helped us to develop the project so that to meet the outside demands. In both types of approach to the dissemination with all available instruments is the fluid that carries information from the project to the outside and vice versa.

In this combined approach each partner was responsible to conduct appropriate activities in their home country and abroad so that to promote the projects’ foreground and give them extra value to shorten the long way between applicable research to the market product and to speed-up the political decisional process which finally is the main milestone in the deployment of such an instrument as is the Mobility Credits Platform (MCP) developed within DEMOCRITOS project.

Generally we were guided in the dissemination actions by the dissemination plan developed in the early stage of the project. Dissemination activities were common for all partners with the aim to spread and share the project as an efficient tool for urban areas in education of people and companies in saving energy and decreasing the pollution.

Results of the whole project were transferred to different target groups: users (company fleet owners, public transport companies, and local authorities), policy makers, experts.

An efficient and coherent communications strategy requires the identification of target groups for which the different dissemination actions should be tailored. Depending on the message that we want to communicate, we have different target groups from individual to the policy makers from civil society / governmental administration to research and industry area. In the case of DEMOCRITOS we identified and addressed to the following target groups:

- Policy makers
  - Services of the Commission and other decision-making institutions of the Union which are responsible for the policies development and which could integrate the MCM as concept within the European regulations
  - Municipalities, local/regional services, local and regional authorities, agencies, decentralized services of the local authorities
  - Policy makers in environment protection field
  - Policy makers in mobility field
- Professionals
  - mobility providers
  - technology providers



- transport planners
- innovation community
- Civil society (citizens)

The dissemination activities during the lifetime of the MCP project included:

1. Development of the project website
2. Preparation of the promotional materials
3. Participation / organization of events

#### 1. Development of the project website

The project website is available from the early stage of the project and was improved during the project implementation according to the partner request so as to meet in the best way the project's dissemination objectives. It contains information about the project's objectives, approach, project status, project sites, public deliverables, planned events, etc. The website address is: <http://www.democritos.ipacv.ro/> . The website administration was an ongoing process during the project implementation. All partners provided inputs for keeping the website well informed.

The site is structured into two sections: a public access area and a restricted intranet area for the use of the Consortium to transfer information and facilitate files exchanges, especially among local implementation sites.

The public area is a key channel for the visibility of the project and its results. Furthermore, this area is a repository for all public deliverables and of other relevant documents; it is a useful consultation instrument for best practices and experiences and a rich archive of links.

#### 2. Preparation of the promotional materials

The dissemination materials produced within the project were designed as a synthetic expression of MCP concept. The partners' support and contribution were key factors in all dissemination actions in order to assure a relevant image of the project and of its outcomes towards the project objectives.

The promotional materials were designed in different forms aiming to express more suggestive and realistic the project concept and the Mobility Credits Model (MCM). Some of these materials have been translated into national language of partners and will be further used to promote the project results. The main dissemination materials developed within the project were:

- a) Project newsletter (NL)
- b) Flyer and poster
- c) Final brochure
- d) Articles, publications

##### a) Project NL

The NLs' development and dissemination was a regular activity through which the project's information, progress and results were transmitted outside the project. During the project implementation eight electronic NLs were produced and were distributed via e-mail to the

partners and then to the groups of interest of the partners. The NLs are published on the project website in two formats: \*.html and \*.pdf.

All partners were involved in the development of NLs. They have sent articles to be inserted in the NL, according to the internal time planning.

#### b) Flyer and posters

The two dissemination formulas were developed as instruments of “need-to introduce” type aiming to present the project and the four pilot cities within the platform of external event in the interest area covered by the project. The two dissemination materials include both textual and graphic elements and represent in a suggestive way the new and innovative model. Both materials supported and complemented the presentations made during conferences, workshops and seminars.

#### c) Final brochure

The final brochure was developed at the end of the project with the contribution of all partners. The brochure was also translated in national language for local promotion.

The main purpose of this booklet was to present in a larger way the project’s concept and the system based on this concept, the pilot cities and the results obtained by this project.

#### d) Publication of articles

The DEMOCRITOS project is an attempt to develop a concept as an intelligent system and this was illustrated in a scientific article presented at the WCTR (World Conference on Transport Research) and further published in the conference book. This action is open and further development of the project in the partners’ countries should be communicated with reference to the DEMOCRITOS project.

Beside the scientific paper the project was presented into two articles in one of the large audience publication: The Parliament Magazine. The articles highlighted the project results as concept, model and IT tool for demonstration and introduced the four pilot cities which experienced the MCM (mobility credits model). Publication are posted on the magazine website (<http://www.theparliament.com/magazines/parliament-magazine/>), 13th September 2010 and 26th September 2011.

Table A1 in chapter 2 contains all the details of these publications.

### 3. Participation at events related to the project action field

The DEMOCRITOS consortium wanted to create and cultivate relationships with its stakeholders using the events as a very important channel for the dissemination. This is because during the events the practices and policies can be shared and discussed thus developing a constructive and participatory dialogue at all levels.

It should be mentioned that under this item were pointed out both events organized by partners and events where the partners participated with presentation or only as a guest, without contribution to the organization of the event.

The events (workshops, seminars, conferences) organized by partners were considered as relevant occasions for partners and target groups to meet and exchange ideas, knowledge and to create partnerships. This gave to the partners, stakeholders and other interested parties a

chance to present the results of the project (and selected results/best practice/findings from related projects) to a wide audience of interested parties.

The consortium also used in several occasions the floor of outstanding national and international events aiming to promote the project objectives and findings in verbal and visual presentations and to give an impulse to the initiatives with special incidence with the DEMOCRITOS project.

Table A2 in chapter 2 contains the complete list of the events, separating the events organized by DEMOCRITOS and events where partner attended.

### **1.4.3 Exploitation of results**

Beyond the statutory dimension which is an intrinsic feature of the Mobility Credit system, the project has brought an added value in knowledge on the management of mobility closely in balance with the environment. For this reason it is important to exploit these valuable achievements in line and in close synergy with the strategic directions of the European Policy:

- improvement in implementing the existing legislation;
- integrating environmental concerns into other policies;
- better information of the citizen.

The MCP is the main result of the project and it can be extended and adopted by other communities with relevant effect on the urban life quality.

The plan for use and exploitation of foregrounds is better explained in chapter 2.

## 1.5 Project website and contacts

The official project public website is: <http://www.democritos.ipacv.ro/>

The website for social networking is available at: <http://www.mobilitycredits.com/>

Partners contact details:

<b>Partner</b>	<b>Website</b>	<b>Contact person</b>	<b>E-email address</b>
Comune di Genova, Italy (Coordinator)	<a href="http://www.comune.genova.it">www.comune.genova.it</a>	Claudia Podestà	<a href="mailto:cpodesta@comune.genova.it">cpodesta@comune.genova.it</a>
TRT Trasporti e Territorio S.r.l., Italy	<a href="http://www.trttrasportieterritorio.it">www.trttrasportieterritorio.it</a>	Enrico Pastori	<a href="mailto:pastori@trt.it">pastori@trt.it</a>
Quaeryon S.r.l., Italy	<a href="http://www.quaeryon.com">www.quaeryon.com</a>	Marco Troglia	<a href="mailto:marco.troglia@quaeryon.com">marco.troglia@quaeryon.com</a>
SSP Consult Beratende Ingenieure GmbH, Germany	<a href="http://www.ssp-consult.de">www.ssp-consult.de</a>	Michaela Haseleu	<a href="mailto:haseleu@stgt.ssp-consult.de">haseleu@stgt.ssp-consult.de</a>
City of Stuttgart, Germany	<a href="http://www.stuttgart.de">www.stuttgart.de</a>	Ulrich Steimer	<a href="mailto:ulrich.steimer@stuttgart.de">ulrich.steimer@stuttgart.de</a>
Verband Region Stuttgart, Germany	<a href="http://www.region-stuttgart.org">www.region-stuttgart.org</a>	Klaus Loenhard	<a href="mailto:loenhard@region-stuttgart.org">loenhard@region-stuttgart.org</a>
TIS.PT Consultores em Transportes, Inovação e Sistemas, S.A., Portugal	<a href="http://www.tis.pt">www.tis.pt</a>	Joao Bernardino	<a href="mailto:joao.bernardino@tis.pt">joao.bernardino@tis.pt</a>
Lisboa E-Nova - Agência Municipal de Energia e Ambiente de Lisboa, Portugal	<a href="http://www.lisboaenova.org">www.lisboaenova.org</a>	Francisco Gonçalves	<a href="mailto:franciscogoncalves@lisboaenova.org">franciscogoncalves@lisboaenova.org</a>
SC IPA SA R&D, Engineering and Manufacturing for Automation Equipments and Systems, Romania	<a href="http://www.ipacv.ro">www.ipacv.ro</a>	Gabriel Vladut	<a href="mailto:office@ipacv.ro">office@ipacv.ro</a>

## 2. Use and dissemination of foreground

### 2.1. Section A

In this section, the publications where the project has been promoted, the dissemination activities attended by the partners and the dissemination activities organized by DEMOCRITOS are listed.

**TABLE A1: LIST OF PUBLICATIONS**

NO.	Title	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Year of publication	Relevant pages	Permanent identifiers (if available)	Is/Will open access provided to this publication?
1	<i>Mobility rights for urban road pricing: a modelling analysis with a system dynamics approach</i>	TRT	<i>WCTR (World Conference on Transport Research) Acts</i>	<i>July 2010</i>	<i>WTCR Society</i>		<i>2010</i>	<i>278 (Book of Abstracts)</i>		Yes (abstract)
2	<i>Developing the Mobility Credits Integrated Platform enabling travellers to improve urban transport sustainability - DEMOCRITOS</i>	QRY	<i>Parliament Magazine</i>	<i>Issue 313, 13th September 2010</i>	International Press Centre	Bruxelles	2010	49		Yes
3	<i>Developing the Mobility Credits Integrated Platform enabling travellers to improve urban transport sustainability - DEMOCRITOS</i>	IPA	<i>Parliament Magazine</i>	<i>Issue 334, 26th September 2011</i>	International Press Centre	Bruxelles	2011	84		Yes

**TABLE A2-1: LIST OF DISSEMINATION ACTIVITIES (EVENTS ORGANIZED BY DEMOCRITOS)**

NO.	Type of activities	Main leader	Title	Date	Place	Type of audience	Size of audience	Countries addressed
1	Seminar/Round Table	Lisboa E-Nova	DEMOCRITOS project presentation	January 2010	Lisbon, Portugal	Policy makers, technicians, stakeholders	25	Portugal
2	Seminar	Municipality of Genova	DEMOCRITOS project presentation		University of Genoa	4° and 5° year students + PhD students	30	Italy
3	Workshop	TRT in collaboration with Municipality of Genova and SSP Germany	Beyond the road pricing policies: concept, acceptability and available technologies	June 2011	Milano	Policy makers, technicians, stakeholders	50	European countries
4	Conference	Municipality of Genova	Final conference of the project	September 2011	Genova, Italy	Local stakeholders, researchers, technicians	About 50	All countries
5	Public event	LHS	Euroepan day	May 2011	Stuttgart, Germany	Wide range of audience	unknown	Germany
6	Workshop	SSP/LHS	-	July 2011	Stuttgart, Germany	experts from the Mobility Working Group of the municipal administration	25	Germany
7	Fair (presentation stand)	IPA	Regional Research Salon	October 2010	Craiova, Romania	Municipality representatives, inventors, researchers, technicians, business representatives	150	Romania
8	Seminar	IPA	DEMOCRITOS project	May 2011	Craiova, Romania	students, first year in Master Degree on Transport Engineering	25	Romania
9	Seminar	IPA	Inventika, International Exhibition of Inventions, Scientific Research and New Technologies, Fifteenth Edition	October 2011	Bucharest, 2011	experts, technicians, researchers and politicians	More than 300	International event

**TABLE A2-2: LIST OF DISSEMINATION ACTIVITIES (EVENTS WHERE THE PROJECT ATTENDED)**

NO.	Type of activities	Main leader	Title	Date	Place	Type of audience	Size of audience	Countries addressed
1	Conference	TRT	World Conference on Transport Research	July 2010	Lisbon, Portugal	Transportation professionals, researchers, managers, policy makers, and educators	Unknown	all countries
2	Conference	TIS	Portugal Conference for an Energy Efficient Economy - PCEEE	June 2010	Lisbon, Portugal	Transportation professionals, researchers, managers, policy makers	Unknown	Portugal
3	Workshop	TIS	11 <sup>th</sup> ANTRAM (Road Hauliers Association)	October 2010	Vilamoura, Portugal	Transportation professionals	More than 200 people	Portugal
4	Political and scientific meeting	IPA	Political and scientific meeting of the CIVITAS MODERN Project	May 2010	Brescia (Italy)	Policy makers, technicians, transporters associations, researchers, fleets operators	100	European countries
5	Seminar/workshop	IPA	Trade Show for Inventions, Scientific Research and New Technologies "INVENTIKA-2010	October 2010	Bucharest, Romania	Researchers, business people, individuals, stakeholders, inventors	Over 300 visitors	International event
6	Forum	Municipality of Genova and Quaeryon srl	CIVITAS Forum 2010	September 2010	Malmö (Sweden)	Large audience from transportation, research, industry, public administration, education	Over 300	European event
7	Workshop	Municipality of Genova	Mobilitiamoci: innovations for mobility	May 2011	Treviso, Italy	Transporters, researchers, technicians	50	Italy
8	Conference	Quaeryon srl	RUCIG (Road User Charging Interest Group)	February 2011	London, UK	Transportation professionals,	Unknown	European countries
9	Congress	LHS/SSP	the Cities for Mobility World Congress	July 2011	Stuttgart, Germany	Political decision makers, transport experts, urban planners as well as representatives from the private sector, research and civil society	Over 350	40 countries world-wide
10	Workshop	TIS	Políticas de Permissão de Mobilidade Urbana: Portagens Urbanas, Zonas de Acesso Restrito e Créditos de Mobilidade para Cidades Sustentáveis	September 2011	Lisbon, Portugal	Political decision makers, transport experts, urban	30	Portugal
11	Brokerage and networking event	IPA	Transport Research Opportunities for South East Europe, »SEETRANS 2011"	April 2011	Ljubljana, Slovenia	Transport experts, urban planners, researchers, representatives of academic area	60	European countries
12	Regional workshop	IPA	Romania – Norway ECOEMERGE project	May, 2011	Craiova, Romania	Environment experts, researchers, municipality representatives	45	Romania

13	<i>CIVITAS RENAISSANCE conference</i>	<i>IPA</i>	<i>Clean urban transport solutions for accession, pre-accession countries and the Western Balkans</i>	<i>September, 2011</i>	<i>Skopje, Macedonia</i>	<i>political decision makers, transport experts, urban planners as well as representatives from the private sector, research and civil society</i>	<i>70</i>	<i>European countries</i>
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## 2.2. Section B

This section shows the main exploitable foregrounds of the project and the plans for their exploitation.

**TABLE B1: LIST OF APPLICATIONS FOR PATENTS, TRADEMARKS, REGISTERED DESIGNS, ETC.**

Type of IP Rights:	Confidential  Click on YES/NO	Foreseen embargo date  dd/mm/yyyy	Application reference(s) (e.g. EP123456)	Subject or title of application	Applicant (s) (as on the application)

Due to the specific nature of the project, no applications for patents, trademarks, registered designs have been presented.



**TABLE B1: MAIN EXPLOITABLE FOREGROUNDS**

Type of Exploitable Foreground	Description of exploitable foreground	Confidential	Foreseen embargo date dd/mm/yyyy	Exploitable product(s) or measure(s)	Sector(s) of application	Timetable, commercial or any other use	Patents or other IPR exploitation (licences)	Owner & Other Beneficiary(s) involved
Exploitation of results through (social) innovation	Mobility Credits Model (MCM) – the theoretical and mathematical model of the system	NO	n.a.	Mobility Credits Model (MCM)	H49.3.1 - Urban and suburban passenger land transport		Only IP Rules internal to the Consortium	All the beneficiaries
Exploitation of results through (social) innovation	Mobility Credits Integrated Platform based on MCM – a simulation tool for the mobility credits concept, the main project result	NO	n.a.	Mobility Credits Platform (MCP) based on MCM	H49.3.1 - Urban and suburban passenger land transport		Only IP Rules internal to the Consortium	All the beneficiaries

Exploitation plan of the project results is mainly oriented towards extending the application of MCP in many European cities and turning it into a tool included in urban mobility policies. Cities should be stimulated and encouraged to experience the new concept developed in the project and to create premises for the development, expansion and subsequent application of the MCP concept.

The exploitation actions are focused on:

- how the outputs and results of the project could be used;
- how the research and simulation tool developed within the project could be deployed;
- how the research could continue after the end of the project.

With reference to the plan for dissemination and exploitation of project results initially drafted in Annex I, the following instruments will allow a wider diffusion of the project results also after the end of the project:

- DEMOCRITOS project website and MCP social network website;
- Distribution of the communication materials (leaflet and final brochure, in English and in national languages);
- Presentation of the main foregrounds in national and international seminars, workshops and conferences attended by the partners;
- Discussion of the project results with local stakeholders in the test case cities, according to the local socio-political conditions;
- Presentation of the project results in other European cities, highlighting the great transferability potential of the MCM;
- Contacts with technology providers, in order to monitor the market evolution and to have an updated overview of the technology benchmark and of the roadmaps for MCP application;
- Use of the main foregrounds of the project to participate to future European Programmes calls, for a further development of the achieved results.

There are three kinds of results which could be exploited:

- studies and technical specification achieved during the project implementation and used for the development of the Mobility Credits Integrated Platform
- Mobility Credits Model (MCM) – the theoretical and mathematical model of the system
- Mobility Credits Integrated Platform based on MCM – a simulation tool for the mobility credits concept, the main project result

The studies and technical specifications were used directly in the project as theoretical basis in the MCP's design and development. These results could be further developed and used to set-up other similar products or to improve the platform MCP as a result of observations during a greater duration of use or due to a larger experience and information gathered after the ending of the

project from available sources.

The Mobility Credits Platform (MCP) based on the Mobility Credits Model (MCM) is the main result of the project and can be applied in other communities with relevant effect on the life quality. For these reasons, the promotion of the MCP and its advantages in different environments and to different stakeholders should be in the partners' attention even after completion of the project. The platform MCP and the demonstration report are key elements on which depends the acceptance of other users.

An important step in the exploitation of the work carried out within the project would be the standardization of the developed model/system. Although the model is very complex and involves many specific issues, it could be defined a minimum of futures that could be standardized. Starting from this core standard, the system could be replicated, adapted and customized according to local conditions. The model standardization would also allow an easier and faster expansion; it means applying the same mobility rules regardless of the mobility area where the model is applied. That means that the same principles would rule private mobility in an area as large as possible.

<i>N°</i>	<i>Exploitable components</i>	<i>Action</i>	<i>When</i>	<i>By whom</i>
1	Mobility Credits Model (MCM)	Development of the model at local level and its promotion in other communities	During events connected with the project content	Each partner promotes the model based on the general innovative concept and adapted to the local conditions in order to speed-up the model deployment. Promotion should be based on the dissemination plan. The requests and proposals that will appear will be presented to the coordinator of the project in order to create a reference model that could be replicated widely
2	Mobility Credits Platform (MCP) based on MCM	Demonstration with the current simulation platform	During events connected with the project content	All the partners
		Development of the platform and change it into a real and operational system	Introducing this action within the current research activity based on own resources or on new projects. It should be mentioned that a new project proposal was submitted in 2010 but wasn't accepted.	Quaeryon (as concept developers) with the support of the other partners

**Table 15: Synthesis of main exploitable components and related actions**

Intellectual Property Rules were laid down before starting the work in the project, within the Consortium Agreement (Addendum 1: IP Rules), agreed and signed by all partners. In the consortium agreements there are specific articles which set-up the rules in case of IPR generation. The consortium agreement contains as main items the background covered by the document, the general principles which govern the IPRs and the access rights to the background defined.