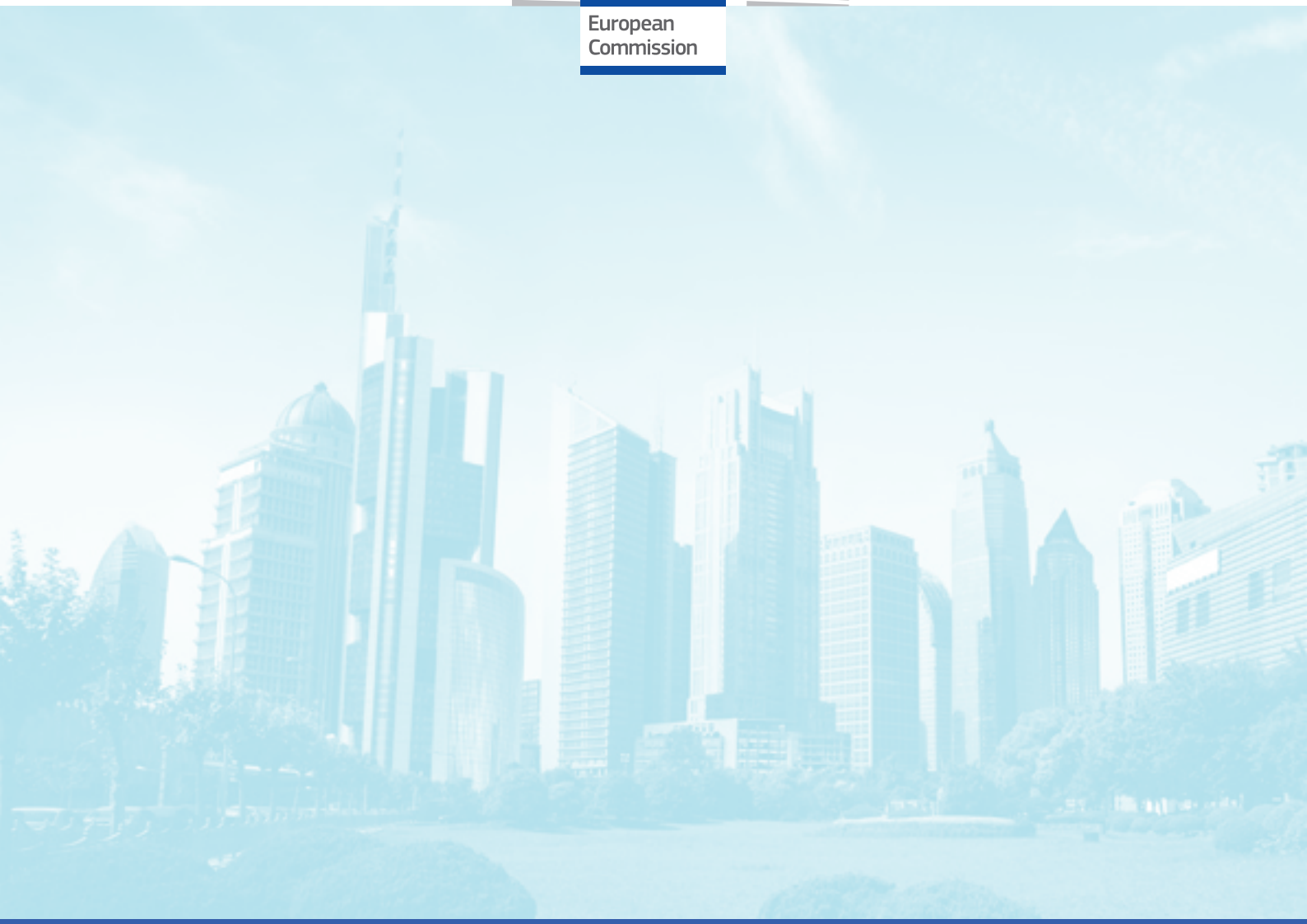

European Commission

Smart Cities

Stakeholder Platform

Smart Organisation of Traffic Flows and Logistics

Key to Innovation Integrated Solution

Smart organisation of traffic flows and logistics

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ABSTRACT

Timely and cost-efficient mobility of passengers and distribution of goods and services are the economic and social lifelines of cities. However, current passenger transport and city logistics still cause substantial local environmental problems in terms of air quality (especially NOx and PM_{10}), noise nuisance. In addition congestion results in social and economic damage. On a global scale energy consumption and GHG emissions are important issues.

One relatively inexpensive approach (in terms of investment costs) to cope with growing transport demand is to provide technological solutions to organise passenger mobility and freight distribution in a smarter way. Within the overall aim to increase multimodality this involves multi-agency interaction, and linking individual mobility with public transport services. Beyond the technical requirements of data exchange it also requires new governance structures to reach changes in mobility behavior. Moreover, the requirement of knowledge of various logistic flows and the optimization of the transport resources enables the development of new business models. Optimization of passenger mobility and transportation of goods require different approaches although share the basic principle and technologies, although, but the optimization of both flows also involves a

This Key Innovation is predominantly based on Solution Proposals submitted by stakeholders. These Solution Proposals include project ideas and pilot projects on data exchange within an integrated city management, using global information on multimodal options, optimised city logistics and stakeholder assistance, and vehicle technologies to reduce negative environmental effects. Thereby interfaces with existing systems, dissemination engines, data fusion and forecast/simulation are tackled.

It can be expected that the better utilisation of existing transport systems and smart ways of data exchange will allow a more efficient use of the transport system as a whole. As a consequence this Key Innovation relates to governance and optimization of the organization of traffic flows.

INTRODUCTION

The Key Innovations (KIs) are a key output of the Smart Cities Stakeholder Platform. The Platform promotes innovation and is part of the Smart Cities and Communities European Innovation Partnership of the European Union. It aims to accelerate the development and market deployment of energy efficiency and low-carbon technology applications in the urban environment. The emphasis will be on their integration, which is a key challenge particularly for Smart Cities' technologies. The Platform aims to bring together technology providers, financiers and specialists in implementing smart city strategies at local level.

The expert Working Groups of the Platform on Energy Efficiency and Buildings, Energy Supply and Networks, ICT, as well as Mobility and Transport select from the spectrum of Solution Proposals (SPs) submitted by stakeholders[1] the *most promising and fundamental* solutions to accelerate the development of smart cities. The focus is on specific promising innovations, considered pillars or technical leapfrogs for integrated solutions in smart cities, thus promising, but standalone solutions, will not be developed into key innovation files and toolkits.

Regardless, if an SP will be part or not of a key innovation document, all solution proposals will be published in the Platform and linked to city profiles. The Platform is not an evaluation body and is open to all relevant smart solutions, large or small scale for cities and their inhabitants.

The aim is to promote through the preparation of a detailed document, a guide for cities on the performance of the innovation, including in some cases wider impacts on city life (such as change of behaviour, environment, social inclusion etc.). For each innovation, this key innovation document will describe the methodology to deploy it, including the technical requirements and the necessary framework conditions, such as existing infrastructures, technical expertise, regulatory requirements as well as the costs involved. The document aims to promote the adoption of the key technology and to identify barriers to deployment to assist relevant authorities in developing solutions to remove them. The document will list the technology providers as well as information of a number of potential financial sources by the EU and other bodies which have supplied information to the platform.

The information in the Key Innovation documents will become an integral part of the recommendations of the Smart City 10 Year Rolling Agenda document the Platform will draft for the European Commission. This document will highlight identified actions at European level required to promote the adoption of key innovations, such as the removal of regulatory barriers or recommendations on the focus of the Horizon 2020.

It is important to stress that this document is not a set of technical proposals or a full evaluation of the innovation, but aims to assist for cities to identify potential solutions and understand their context and implementation needs. It does not exempt or substitute a detailed cost/benefit analysis and implementation plans for cities that wish to introduce the innovation. The Stakeholder Platform cannot take any responsibility for inaccuracies or missing information or specific problems in the implementation of the proposed Key Innovations or other Solution Proposals.

[1] Solution proposals are published on the web site: www.eu-smartcities.eu/ solution-proposals

Description of a Key Innovation

A key objective of the Smart Cities Stakeholder Platform is to identify Key Innovations (KIs) for the development of Smart Cities. The selection of an SP as KI is based on the following criteria: **applicability, simplicity, affordability**, **usability**, the extent to which it addresses technology integration and if the potential impact is significant. Selected SPs will then be enhanced by the Platform's technical Working Groups (WGs) to develop KIs, adding the following aspects:

- Premises for the technology development and up-take (e.g. problems, what the technology is intended to achieve, other unforeseen benefits for the smart cities);
- Potential integration with other technologies and sectors, including use of ICT;
- If necessary, enhancing the information from the SP on the urban environment in which the technology can be applied;
- Key pre-requisites for the applicability of the key innovation, such as the required enabling environment;
- Instruments and market conditions needed to reach commercial viability.2

KIs will be completed by the technical WGs in collaboration with the Finance WG. This group will analyse the financial needs of the KI as well as their financial viability and bankability. The members of the WG will provide information on funding sources. The result will be published as a Key Innovation Toolkit.

The Toolkits thus provide practical solutions that can create an enabling environment for the application and replication of key innovations in a smart city.

[2] This includes a description of the main EU support instruments, such as the Risk Sharing Financing Facility

1. PRESENTATION OF THE KEY INNOVATION

Solution Proposals integrated in this KI

Submitted to the platform at date (Innovation maturity)	*Body(ies) submitting the proposal(s):*	*IP right holders:*	*Problem addressed*	*City (ies)*	*Parties or stakeholders involved:*
1. Integrated City Management Platform					
24 Sept 2012 (Pilot Project)	Jose-Carlos Riveira-Martinez, **Schneider Electric**	Schneider Electric	Data exchange between existing systems (multi agency interaction)	Barcelona, Dallas	city transit and traffic agencies, parking concessionaires, EV-stations distributors, emergency services, city road authorities, others
2. INTEGRA – Utilisation of collective transport for travelling					
1 Oct 2012 (Pilot Project)	Dominique Breuil, **EIGSI**	EIGSI	Visibility and accessibility of medium sized cities. Utilisation of collective transport to reach cities and inside cities.		travellers, local authorities, tourism organisations, software developers
3. Optimised monitoring of freight flows in smart cities					
6 Oct. 2012 (Project Idea)	Dominique Breuil, **EIGSI**	/	Integration of city logistics in global transport system		logistic companies, local transport authorities, software developer
4. Low Noise Urban Freight Transport					
3 Oct. 2012 (Pilot Project)	Henning Schaumann, **Fraunhofer IML**	/	Urban Freight Traffic Noise		logistic companies, retail, local transport authorities, vehicle manufacturers

5. Route/ Parking combined info (Driver on trip information)					
18 Sept 2012 (Pilot Project)	Jose Carlos Riveira-Martinez	/	Nearest available parking space (Specialized App for combined on-trip information to drivers, based on already available data on traffic situation, parklot occupancy and on-street parking availability)	Barcelona	Traffic management authority, parking concessionaires , end-users
6. iOS-Android App for personal routes and parking availability					
24 Sept 2012 (Pilot Project)	Jose-Carlos Riveira-Martinez **Schneider Electric**	/	Traffic & Parking on-trip information		software developer, city government, vehicle driver
7. Innovative 2.0 car-pooling solution					
21 Dec. 2012 (Pilot Project)	Ana Herrera, **GMV**	GMV	Efficient and sustainable mobility	Madrid, (proposed also for other medium size cities, such as Valladolid (Spain) and others)	Technology provider, local transport authorities, commuters (and /or travelers in general), companies /industrial zones (for company-focused car-pooling), universities (for students-focused car-pooling)

1.1 Description of the innovation and rationale for selection

The SPs have been selected based on the following evaluation grid:

Evaluation Criteria (Score: 1 to 5)		Weight
1. Impact over GHG emissions		25%
1,1	CO2 reduction,	
1,2	Increasing share of renewables,	
1,3	Increasing energy efficiency	
2. Economic issues/ cost-benefit-ratio		25%
2,1	Affordability (mobility costs for end users)	
2,2	Economic viability (period for return of capital)	
3. Smartness of Innovation		25%
3,1	Innovative nature/ progress to the state-of-the-art	
3,2	Integration into the urban transport system, handling existing (infra-) structures	
4. Potential for market uptake and replication/ customers experience		25%
4,1	Potential for scale-up and replication	
4,2	Barriers to market entry (e.g. vendor lock-in or non-interoperable protocols and rules)	
4,3	stakeholders involvement/ consumers attractiveness (e.g. user-friendliness of the technology)	
Total Score		

The result of the evaluation by all WG members of the SPs selected for this KI was as follows (scale = 1 (lowest effect) to 5 (highest effect)):

criteria	SP#1	SP#2	SP#3	SP#4	SP#5	SP#6	SP#7
1	2.83	2.67	2.67	2.50	2.10	2.33	2.87
2	3.33	4.00	4.00	3.13	3.65	3.50	3.69
3	4.17	4.00	4.00	3.29	3.00	3.33	2.73
4	3.89	2.67	2.67	3.11	3.38	3.67	3.05
total	**3.56**	**3.33**	**3.33**	**3.01**	**3.04**	**3.21**	**3.09**

Timely and cost-efficient mobility of passengers and distribution of goods and services are the economic and social lifelines of cities. However, current passenger transport and city logistics still cause substantial environmental problems in terms of air quality (especially NOx and PM_{10}), noise and congestion.[3:] The overall challenge is therefore to reduce the negative environmental and congestion effects in passenger mobility and freight distribution, while adequately satisfying the transport demand of both flows.

The scope of this KI is obviously quite broad and many solutions have already been designed and implemented in cities to improve traffic flows. An analysis of the demonstration and experimentation projects done in the fields of monitoring and coordinating these flows at city level show that the success of these actions depends three key aspects which are interlinked and that have emerged in mobility projects across the EU:

- a holistic vision of the various systems constituting the mobility space in the city. Such approach is the starting point for integration and interoperability between systems.
- a social approach of the stakeholders involved in the various systems, which covers both the continuous adaptation to the evolution of their needs and the set-up of new governances.
- the information systems to facilitate the understanding between actors as well as the communication between systems. These information systems rely on one the hand on ICT and software and on the other hand on concrete objects from street signing to leaflets.

[3] E.g. "White Paper Roadmap to a Single European Transport Area – Towards a Competitive and Resource-efficient Transport System", European Commission, March 2011. (http://ec.europa.eu/transport/strategies/2011_white_paper_en.htm) and "Economic Aspects of Sustainable Mobility", European Parliament, October 2011 (study performed by Fraunhofer Institute)

The scope of proposals underling this KI focuses on solutions which are related to these bridging, merging and facilitating factors covering both technical as well as social aspects.

Experiences so far show that most of these solutions are rather simple and may be implemented with relative low investments since they generally did not require large changes in infrastructure. Accordingly, the set up times are technically quite short.

The possible solutions create a smart organisation of passengers flows and city logistics. These solutions can be grouped in five categories:

- Mobility management centres
- Mutualisation of transport resources
- Multi stake holders consultation methods
- Guidance systems
- Coherent parking & mobility pricing strategies

The seven Solution Proposals presented at the start of this section address innovative approaches involving at least two of the key factors mentioned above.

Some proposals focus on the development and implementation of decision supporting tools for various stakeholders, on the optimisation of the utilisation of existing infrastructures and mobility resources (vehicles, delivery bays…) and on the involvement of stakeholders to increase the efficiency of the actions proposed by Mobility Integrated Management.

In order to avoid the new construction of costly infrastructure for growing transport demand, one important approach is to provide technological solutions to organise mobility and traffic in a smarter way. This involves **multi-agency interaction**, linking individual (electro-)mobility with public transport services.

One promising pilot project is an IOS-Android App for personal routes and parking availability. It considers travel time estimations based on real-time traffic status and is extendable to EV charging poles (SP, number 6). Moreover, internet platforms, operated by large employers, can help to bring people with same transport needs together (Innovative 2.0 car-pooling solution, SP, number 7).

Beyond person transport also the organisation of logistics can be improved in a smart way. Monitoring of urban freight flows used as input for optimisation can decrease the negative impacts of traffic. This requires to have knowledge of the various flows and the optimisation of the transport resources. It also enables the development of new business models around these new services.

Some of the 7 SPs, underlying the KI, are based on approaches which generate new governance structures aiming to reach changes in mobility behaviour. Multi-modal Information, booking and payment systems are able to link (electro)mobility services with those of public transport. Standardised interfaces allow an integration of the e-mobility charging infrastructure with other infrastructure components such as public transport ticketing and car-sharing. These exchanges of information include the relations between stakeholders of city logistics which have to exchange on the accessibility of routes or delivery bays, on the availability of docking facilities at Consolidation centres, on the required/ forecasted deliveries, etc.

1.2 Deployment status

This section focuses on the requirement for the deployment of the SPs

Main requirements

Despite their relative simplicity the submitted solution proposals require changes in behaviour and adaptation to new models of governance. Therefore, the benefits of the potential low cost and speedy implementation can soon be lost if the implementation is not carefully prepared among stakeholders and beneficiaries. Therefore well prepared implementation is essential to avoid unforeseen difficulties and perverse effects, which may lead to failures.

The challenges for innovation are related to the three key aspects described above, and to the integration of passengers/goods, and concern various domains such as:

- the methods and organisation of collaborative data exchange of multiple systems towards the generation of value added information for management and dissemination;
- the interconnectivity and interoperability of transport systems by better information at regional gateways (e.g. INTEGRA);
- mutualisation of freight flows in cities, e.g. by a software based synchronisation and coordination and stakeholders involvement (cf. SP # 3);
- to untangle movement of travellers and freight flows by using larger time slots for delivery;
- Behavioural changes for many stakeholders, from the design and implementation of new governance to individual awareness and acceptance of new mobility modes.

To ensure the success of the implementation of solutions in the five categories, four basic conditions must be fulfilled:

1. To have a holistic (already mentioned) and multilevel approach, long term horizon objectives, and the possibility for real time actions. Moreover coordination between levels is necessary and must be regularly checked in order to keep coherence between objectives and on the street actions (for instance application of regulation concerning deliveries access, delivery bays…). All of these solutions require:,
    - Specific governance organisation to be designed
    - Coordination mechanisms to be implemented
    - Stakeholders must know and understand each other.

    As a consequence, overall mobility management will require further integration and coordination between all flows; the degree of involvement of local authorities and the detail of its actions will depend on the local strategies set up by politicians and on the practices in each city/country.

2. To obtain accurate and updated data at each level of decision taking, both for the mobility managers and for travellers. Local authorities to provide reliable and accurate information on mobility services to stakeholders as well as to clarify their image as mobility organisers, both for residents and visitors. The proliferation of software applications, some of them due to the EU Open Data Directive, can be a hurdle. Sometimes it is difficult for cities to avoid that unreliable apps create errors and damage the image of the city's mobility network. Clearly, it is not easy to organise flows without the accurate data regarding goods, passengers' mobility… As a consequence, such more or less detailed studies (depending on the level of decision) are always a prerequisite to implement these solutions in a specific city

3. Efficient information systems must be installed for communicating with all stakeholders and continuous improvements must be looked for in order to follow the evolution of the users. This concerns not only the software itself or

the on street signing but also the utilisation of social networks, or adaptation to the new behaviours and demands of web native people.

4. To achieve interoperability between all systems. This must be done of course for software and data. However, interoperability also involves organisations as well as equipment at the physical level (e.g. the on street or traffic hubs unloading facilities)

Satisfaction of user needs

Mobility management centres

The concept of centralizing traffic decisions must encompass all the facets of mobility

This concept has 2 main objectives:

- To propose environmental friendly transport modes adapted to the mobility requirements of travellers and goods at one specific moment for one specific travel (e.g. delivery with eV sharing).
- To organise and optimise the utilisation of transport resources, individual or collective ones as well as infrastructures (e.g. utilisation of delivery bays by cars during the times that no deliveries can be done).

Mutualisation of transport resources

Mutualisation is a new concept to optimize the utilisation of transport (infrastructure) resources. Passengers flows, all along the day & night, do not always fill up these resources which can be mobile (buses, trams,…) or not (dedicated lanes, park and ride P+R) installations…)

Obviously, the main objective is to reduce the freight flows in the city; secondary objectives may be also attached to the deployment of such solutions like

- the (partial) utilisation of P+R as Consolidation centers or delivery points for users of the park, avoiding to go to a drive in home deliveries)
- the external warehousing for city centres allowing shop keepers to use the full shop as a selling space when shop supply is fast.
- incentives like the "goods/ passengers" car sharing, which can be paid to the driver……

Guidance systems

For the last decades, one of the recurring issues that appear in mobility studies is the significant, and continuously increasing portion of traffic flows within highly congested city centers. As part of the day-to-day traffic congestion, recirculation for parking search or congestion avoidance is a key point to be addressed, not only due to its quantitative impact (from 10% to 20%) but also because of the specific driving patterns (low speeds, erratic behaviour, flow-breaker, unexpected stops, etc...). The consequences of recirculation highly impact both on safety, air-quality and “liveability”.

The main goal of guidance systems is to actively manage the demand as a significant aspect of mobility, focussing on quicker achievement of driver needs during the parking process and smoother distribution of traffic flows along the available city corridors. Guidance systems, taking into account the active global situation and based on a personalized approach, help to reach this goal by providing suitable information to individuals both before and during the trip. The personalised approach is a key aspect as it combines individual needs and overall situation awareness. Thereby guidance is not only considered as a tactical approach for the trip but is aimed to enable demand management on a time-based approach, as providing feedback on optimum moment and transport media for achieving the most efficient trip.

Coherent parking & mobility pricing strategies

The main objective of this type of solutions is to provide both residents and visitors with easily understandable regulations and operational modes all over the parking facilities

of the city and at the same time to reduce the pollution emissions generated by vehicles circulating or in traffic jams (noise, emission, space occupation..).

Multi stake holders consultation methods

Collaboration and cooperation between stakeholders to find the most appropriate solution or consensus agreed by all, are key elements in mobility improvements. Then new approaches need to be piloted/experimented in order to: involve the various stakeholders; to find real representatives; or to build efficient target groups. The main objective is to make these stakeholders able to understand the constraints and objectives of others and to accept to take them into account. Regarding freight/passengers flows, some very efficient methodologies have been set up in the FQPs (Freight Quality Partnership) promoted firstly in UK (Department for transport - http://laqm.defra.gov.uk/action-planning/measures/freight.html).

1.3 Technical feasibility and viability

Of course the integration of mobility will be adapted to each city according to several criteria ranging from the size and topology to the culture and history. Then this integration is not only the outcome of a set of various software solutions, but also an answer from "mobility managers" to improve the flows and satisfy various "mobility customers". Different versions of integration will be implemented to match the local requirements. To find the most suitable mobility organisation for a specific city, methodologies or approaches must be developed, leading to different types of governance, based both on technological facilities and local strategies.

Several cities have already engaged the first steps towards integrated flows management, for passengers or goods. Demonstrations, experimentations can be analysed and evaluated, even if the success levels have been relative they have provided considerable information of citizen behaviour in complex transport networks. Such examples can be found at the European level (for instance in the CIVITAS initiative) or at the national level; these demonstrations usually resulted from large programs or from local political decisions.

However, in a very large majority, these demonstrations have focused on a specific area in the city and/or the integration concerned only a part of the mobility modes available in the city. Also most of these demonstrations focused on a pricing / ticketing strategy (e.g. Navigo in Paris, Oyster in London…).

The integrated management of city logistics is usually less developed than passengers' logistics. Obviously this is due to the lack of interest of local transport authorities in this domain during the last decades; however, there is a strong growing concern from local politicians and citizens to improve these flows and put them at the same level of environmental impacts as passenger flows. There are very few examples of global monitoring of city logistics over a large part of a city. The few examples available include attempts in Montpellier (France) and Lucca (Italy).

Mobility management centers

Present status:

Several Mobility management centers have been implemented around Europe and over the world. To adapt the various flows of specific situations the range of decisions varies from long term horizon to real time actions

An Integrated City Management Platform is currently tested in Barcelona. Integration as the overarching key objective, allows creating intelligent processing based on available data and value added information. Interaction and integration are the keywords considered as part of a global strategy to create a city platform

Emerging solution for smart cities:

Recently several cities implemented such centers on a quite broad range of possible interventions on traffic (Bologna, Funchal (Madeira), Burgos..) but quite often with a specific objective like access restrictions (Krakow, Venezia), safety (Genova) or a dedicated area like bus lanes or freight (e.g. Tallinn (Estonia)) . Some of these centres are also monitoring (partially) freight as well as passengers flows like in the cities of Utrecht, Bath (UK) or Aalborg (D).

Mutualisation of transport resources

Present status:

This approach is increasingly applied in projects, both at the national level (like CGOODS in France) and at the European level (e.g. CIVITAS, IEE, INTERREG…); moreover these projects have resulted in some additional demonstrations realised in partner cities.

Low noise delivery projects based mainly on the achievements of the PIEK project. The PIEK concept was first developed in the Netherlands, and is now being implemented in different countries. Low noise delivery is another example of mutualisation, since it requires in some places adaptation of infrastructure for the night or permanently.

Emerging solution for smart cities:

Mutualisation of resources: For example distribution by bus from (Urban Consolidation Centres) UCCs and the last mile with cargo cycles
Specific trams,

Mutualisation of infrastructure: usage of dedicated lanes at some off-peak hours, specific access to access control zones

Solutions have to be tuned to the city size and topology; necessity to coordinate the delivery plans from UCC with the transport schedule and to synchronize with final delivery

Guidance systems

Present status:

Multiple systems to integrate available data of existing systems are already in operation. Several small prototypes concerning the necessary software have been developed in order to test the technical feasibility. A standardisation through specific software connectors needs to be developed…

Technology is now mature to provide horizontal integration, based on deployment of service-bus capabilities and service-oriented architectures. Also, easy integration of additional services and information, benefits for a higher number of agencies and companies, and operational intelligence is now possible.

Cloud-based services, with high independence of the final users, effective communication channels and high-availability are basic issues for creating an interoperable environment for information processing and dissemination.

INTEGRA is a Pilot Project which groups 25 cities among them La Rochelle, Angouleme, Liverpool, Lisbon, Porto, Rennes and Santander, as well as some regions like Poitou Charentes, Basse, Normandy, Bretagne.

Emerging solution for smart cities:

Coherent parking & mobility pricing strategies

Present status:

Route parking combined information.

Examples: Dynamic allocation of delivery bays, (low) EVs tariffs, specific pricing conditions for craftsmen, changing parking behaviour (Aalborg) Park & Ride parking guidance system (Monza, Italy)

Specific guidance for freight (Tallin, Preston, Aalborg…)

Emerging solution for smart cities:

Time dependant dynamic control of access and tariffs .
Specific incentives for craftsmen and delivery people according to access time in the city, or using combined P+R/UCC to park their vans the deliver in city through UCC facilities
Special parking tariff in P+R for people which are delivered in the P+r …
Change the schedule of main institutions in the city (for example start working 15 min later or sooner), in university of education bodies and define an incentive in the form of a pricing mechanism for that. Similarly opening hours of shops could be pre- or postponed which in turn impacts the time window for shop deliveries..

Requirement : to develop an analysis of the flows (individual/freight), a representative study (different scenario) of the impacts of different pricing strategies showing the behaviour changes.

Multi stakeholders consultation methods

Present status:

Freight Quality Partnerships (FQPs) in UK

Emerging solution for smart cities:

See e.g. http://www.londonsfqps.co.uk/

1.4 Financial analysis

This section presents an initial financial evaluation, based on the estimations of the solution providers.

Evaluation

Financial analysis of complex solutions involving several systems and actors is intrinsically difficult. This is also the case for the 7 SPs conversing into the 5 categories presented in paragraph 1.3 (Mobility management centres, Mutualisation of transport resources, Guidance systems, Coherent parking & mobility pricing strategies, Multi stake holders consultation methods).

The challenges in quantifying costs do not originate from the technical components which are rather easy to evaluate (software, light infrastructure,…) both for procurement and implementation. Key uncertainties mainly come from:

- The different approaches of the stakeholder to realise this estimation (for instance profitability or ROI horizons)
- The indirect effects on/from other projects
- The collection of quantitative (or even qualitative) data appropriate for relevant indicators.

Then specific evaluation techniques need to be set up, from simple data gathering to more sophisticated Cost Benefit Analysis. (cf Evaluation handbook outcome of MIMOSA project[4]). Generally, conducting a CBA is difficult in the context of integration of services based on software development. In the mobility domain, many stakeholders are involved and indirect effects attached to the valuation of the knowledge or of the information received before action are both numerous and not easy to identify. Costs, benefits, or perverse/ unexpected consequences of these effects are not easy to take into account
Some of the surveys and CBA made in similar occasion during CIVITAS show both these difficulties. However, the feasibility if the evaluation methodology is defined before the action which allows to set up and follow right and coherent indicators.

The costs mainly comprise marketing and promotion of the new organisation technologies towards the city. This includes the necessary investments concerns the development and marketing of the software. It is also necessary to take into account the cost of collecting, formatting, processing and updating the information, which is generated by human resources in charge of the accuracy and validity of the analysis returned to external stakeholders. As all innovative projects, there are also costs of the innovations, from benchmarking similar / interesting experimentations to drawing back unsuccessful tests.

Integration platforms have direct and indirect effects on cost reduction based on the following aspects:

- Integration is also applied to management groups so tending to reduce dispersed agencies and grouping them in a common place with shared facilities. The investment made and cost reduction generated usually allows an return on investment time ROI of around 3 to 4 years,
- Hosted and Cloud-based solutions provide reduction in maintenance, higher availability of the developed solutions and shared costs (in case of SaaS business model). In this case, CapEx is clearly substituted by OpEx, allowing better costs control.

Time scale

Due to the type of this KI, 2 different time scales must be considered.

[4] http://www.civitas-mimosa.eu/main/index.php?option=com_content&view=article&id=313:mimosa-to-publish-civitas-evaluation-manual&catid=45:articlesfrontpage

The first time scale is related to IT evolution and availability; this is very short term and all tools for integration are already available or could be there in the near future. Interoperability exist, especially if data management respect EU standards, although it needs to be reinforced and increased.

Personal ICT devices are also quite well disseminated and more and more people are familiar to their utilisation.

The second time scale concerns the behavioural changes such innovation will generate from all stakeholders. Several causal relationships may be triggered which may decrease this time scale, usually several years long, as far as transport is considered. Through new technology information systems, integrated management can spread easily among the mobility customers as well as goods carriers at the city/area level. This is a valuable aspect of the city life and represents an interest to come and live in such a city. Through the competition between cities, the demands from residents aware of the evolutions, the changes will be accelerated.

Risk estimation

These improvements are mainly linked to information technology and human behaviour. Then the costs will be quite low compared to usual improvement in transport and do not need long term financing/funding. Even if municipalities are impacted by the current general crisis, there are several profitability methods possible. For example by developing software that could be used by these municipalities to generate benefits out of new strategies for providing information to mobility customers.

Financial overview of each category

Mobility management centres

Usually, existing and independent control centres in a city tend to be grouped in a common place, to leverage knowledge and use of common tools as part of the integration process. Thereby the real physical interaction of individuals and agencies for emergency management, traffic and transit operation, information dissemination and reporting/analysis for continuous improvement will be increased.
This already drives cost reduction and profitability of available data, both for public and private stakeholders.

Also, benefits for smaller cities and regions are crucial as the integrated environment can provide shared platforms and capabilities together with consistent cross-area coordination, making benefits also for lower end groups.

Mutualisation of transport resources

However some costs will be required concerning the city logistics. The success of integration of urban freight rely partly (necessary but not sufficient condition) to the implementation of Consolidation Centres (and delivery fleets), under the responsibility of local authorities. Such a deployment represents an investment which can be returned at medium term if the municipality manages the logistics organisation over the city.

Guidance systems

Efforts on creating “operational intelligence” at lower cost is one of the main advantages of integration systems as a clearly defined structure can serve multiple purposes, for multiple providers/consumers, in a standard way, by mean of applying regulations and standardization in accordance and as an extension of the EU ITS Directive for provision and use of available data to foster mobility information business.

Coherent parking & mobility pricing strategies

This strategy can be carried out in a budget-neutral way for local governments. That means that cost reductions to incentivize a shift of “smart flow” parking and mobility behavior towards quiet times and areas could be balanced by increasing the costs for parking and mobility in busy hours. Possible additional cost involve (modification) of ict systems and additional control systems.

1.5 Suitable city context

As integration and collaboration implicitly requires multiple actors, SP#1 is applicable in cities and regions with multiple systems already in place. Existing systems provide the base operational environment, oriented to single-domain/vertical monitoring, control and optimization. External data availability, on a standard basis or developed ad-hoc, is required to enable integration and added-value intormation generation. Another key aspect of SP#1 is associated with collaboration, enabling global optimization by information exchange, reuse of available data in other contexts, proactive action plans if needed. Usually, cities/regions, and associated agencies, as a preliminary step, create consortia for mutual intrest and plan to share a common platform for integration, interaction and dissemination as part of a strategy towards cost efficiency and operational effectiveness. In fact, a typical trigger for such collaboration is information provision to citizen using web-portal, automated call-center, open-data repositories and others…

SP#5 and SP#6 are mostly oriented to personalized services for efficient mobility. SP#1, as information integrator, already is a key enabler for one-stop-shop provider for certified/accurate information. Relevant conditions to implement such services must also consider high penetration of mobile equipment (smartphones, tablets), collaboration with market navigation companies, and available Telco networks (public mobile telephony or wifi/wimax coverage) considering high bandwidth and low cost of data connections. As wireless data communicactions are a critical aspect, business cases may involve specialized companies in consortia that can create a suitable business-case for ROI.

2. EXPECTED IMPACTS

2.1 Energy supplied or savings expected

It is expected that the combination of different systems leads to a more efficient use of the transport system as a whole. Efficiency will be reached by collaboration. This could be proved by the evaluation for pilot projects. Moreover, savings can be realised by using collective rather than individual transport.

Integrated management intends to promote the usage of collective transport; then all actions in this KI will lead to a reduction of personal and individual transport and an increase of collective and/or soft modes.

Energy saving is moistly directly related to GHG emissions achieved (see quantitative impact estimation in next section).

2.2 Expected impact on GHG emissions

In several projects a reduction of 39% of CO2 emissions and at least 20% of. Moreover, noise pollution can be reduced by up to 50%. Generally speaking the expected impact on GHG emissions is directly linked to the energy savings expected.

Emissions are proportional to energy savings for all types of ICE vehicles, using petrol or diesel.

It is important to realise that “rebound” effects are likely to occur. That means that a smarter organisation of transport of passenger and goods may e.g. results in a 10% GHG cut for the same transport performance compared to the reference situation before implementation of the smarter organisation. However it is likely that the improved transport situation will now attract *additional* flows of both passengers and goods. Strictly speaking this would be a volume effect, rather than a transport efficient effect. Nevertheless on balance part of the GHG reduction achieved will be lost by this rebound effect.

Noise reduction is also concerned by some parts of this KI which includes the deliveries by low noise vans.

2.3 Interfaces with other technologies/ transport modes

Generally, interfaces are one key aspect of smart organisation of traffic flows: with existing systems, dissemination engines, data fusion and forecast/ simulation.

The freight logistics concepts are clearly linked to passenger transport, since the same (vehicle) capacity, infrastructure and information systems are used.

Interfaces with other IT systems deployed in transport network are obvious (passenger/ traveller information systems). Proposals may also concern interfacing to other on board or remote equipment such as

- Automated guidance of vehicles (generally electric)
- Energy planning for systems on street charging stations for car sharing or fleets of EVs
- Distribution or production management systems in logistics companies
- Monitoring / traceability of products/ parcels (RFID/ internet of things)
- …….

2.4 Waste generation

No waste is generated by these proposals which on the contrary can provide help and facilitate the organisation of waste removal in city centers (for instance shop waste).

2.5 Wider potential benefits for cities

The wider potential benefit can be seen in the increase of utilisation of collective transports accessibility from all over Europe via large gates/ hubs.

Also, information dissemination to citizen can be completely revamped, providing in many cases the opportunity of a “one-stop info desk”, available public information and additional or premium facilities to be developed and provided by external info-sellers.

Emissions and Noise reductions is already beneficial for citizen, avoiding related health problems, enhancing quality of life.

Leveraging pre-existing integration platform and pushing its use to domains out of the mobility domain, can easily strengthen citizen and visitors relationship, aimed to help on economic activities such as tourism, commerce and so, by providing value-added information on mobility, key city places, pushing commercial offers or advertisements.

Suitable information management, based on multiple criteria, can also, at some point, provide demand management, enabling smarter policies for lower levels of occupancy in public places, museums, crowded areas, by means of recommendations and indications on available.

2.6 Other expected impacts

Clearly, interaction between different stakeholders is beneficial for many operational and organizational aspects, allowing a complete range of data exchange, operational intelligence to be developed, information dissemination and creation of economic activity, by leveraging increased mobility, reduced congestion, public transport prioritisation and promotion, efficiency for logistics, reduced consumptions and emissions, and other aspects of day-to-day life.

3. ADDITIONAL REQUIREMENTS ON DEPLOYMENT

This section presents the requirements for wider deployment of the innovation. It indicates any potential barriers or risks facing wider deployment or replication elsewhere.

3.1 Governance and regulation

Governance plays an important role within the smart organisation of traffic flows. Thereby the capabilities of existing agencies for improvements in mobility, energy efficiency, environmental issues and risks management are crucial.

Considering size as a critical parameter for efficiency related to integration, different scenarios may be considered as suitable:

- Data integration and coordinated management within a city, considering a vertical hierarchical structure, where efficiency is the main objective. In this case cities and regions of more that 200khab may be high potential adopters
- Shared platforms and solutions are also highly appreciated by neighbour regions, increasing their management capabilities at lower cost and fostering the interactive management.

Although this KI is mainly related to information management, and governance, stakeholders involvement as well as infrastructures and transport resources are parameters which influence strongly the deployment on such innovations. Cities which propose rather few up to date mobility services, which do not implement infrastructure adapted to the evolution of customers' requirements will have difficulties to motivate their citizens/ visitors of the benefits of integrated management.

Governance must be adapted both to the local context of transport organisation (ex regulation/ deregulation) and to the strategies of local authorities. Then conflicts may happen with and among operators which can be solved if all stakeholders needs are considered (i.e. customers, travellers,..).

Also, communication channels may be needed to involve citizen into innovations and improvements. More than only citizen's feedback, crowdsourcing is appearing as a potential and relevant source of information to allow awareness and proactivity in governance actions and rules.

As in most other sectors, personal data protection is already a must to allow coexistence of information gathering and personal privacy, having to be reassured by suitable regulations.

3.2 Stakeholders to involve

This section identifies the different stakeholder that need to be mobilised to successfully introduce the technology in the urban area, such as households, specific professional bodies, corporations, specific authorities (transport authority), etc,

Stakeholder	**Role/ how to be involved**
Mayors/ politicians	Decide on regulations and their enforcement and develop the political support for smart solutions.
City administration	Implementing regulations and enforcement, handling new administrative impacts of smart solutions.
Tourism organisations	Data and services providers, mobility

	services users
Logistic companies	Shared-distribution centers, last-mile electric delivery services. Flexibility and corporation (incentivised by the regulations)
Public transport companies	Intermodality and modal-shift, flexibility and adapting services to allow a good connection with new smart solutions
IT providers/ software developers	New tech services, personal apps, facilitating e.g. on platform services and booking
Inhabitants/ end-user	Information Produces/consumers
Financial institutions	Pro-active financial support and openness to innovative financial constructions.

3.3 Supporting infrastructure required

Not applicable

3.4 Alignment of administrative levels involved

Implementation of KI's in cities will be supported by funding mechanisms and other (policy) incentives at different administrative levels: city, national and EU. However, some initial interviews on the challenges that cities face during the roll out of sustainable mobility projects indicate that the supporting frameworks at the city, national and EU-level are not always optimal aligned. This is especially evidenced by the preliminary evaluation of several urban electro-mobility initiatives.

City officials indicate that successful implementation of sustainable mobility initiatives requires a highly flexible tailor-made approach; especially through cooperation with local key-stakeholders. This approach involves flexibility of implementation trajectories regarding: timing of roll-out, adjusting overall project size, as well as the possibility to involve (new) public and/or private partners. In contrast, national and EU administration levels typically aim to develop longer term policy frameworks that need to be uniform and shaped in a verifiable format, thereby limiting flexibility. The challenge for future incentivizing frameworks is to bridge the gap between the need for local flexibility and the aim for long term uniform and verifiable policies at the higher administrative levels.

4. POTENTIAL FUNDING SOURCES

The Finance Group of the Stakeholder Platform has prepared documents on funding models and the use of EU Funding instruments, either from the EU budget or from the European Investment Bank. The documents are freely downloadable from the Stakeholder Platform's website.

- For funding models please refer to the **"Financing models for Smart Cities"** guidance document.
- For EU supported funding instruments please refer to the guidance document on **"Using EU Funding mechanisms for Smart Cities"**.

This section presents specific recommendations for financing models and potential sources suitable for this KI**"**.

4.1 Financing models suitable for the innovation

This KI is composed on a range of relatively independent Solution Proposals, most valid on their own which can be standardised to allow for an efficient integrated system. Many of the components face organisational and standardisation barriers which are not linked to finance and need to be addressed.

Funding of the different components can be handled separately and the main issues are organisational and the stepwise introduction of integrated systems. The pricing model needs to be devised depending on data ownership, service provided, level of public to private benefits. This needs to be tested large scale at city level and would need research support.

The existing experiences can be combined into a more holistic integrated approach, which would also address "rebound effects", unintended behaviour caused by a reduction in congestion (incentivising the use of cars again). A project at such large scale has clear benefits for European cities and support for R&D and capital costs for the demonstration is warranted. Funding from Horizon 2020 would be warranted.

4.2 Specific sources of funding for the KI

No specific information collected at this stage

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...brings together people, industry and authorities from across Europe to make our cities more energy efficient, better to live in and growth-friendly.

...is about developing concrete innovative solutions for cities through tailored innovations.

...facilitates the exchange of knowledge and best solutions across smart cities in Europe.