WPT2

Innovative Tools to increase acceptability and effectiveness of low-carbon mobility policies for city centers

Activity A.T2.2

Identification and detailed design of Value-Added services for LEZ

Deliverable D.T2.2.2

Support tool (toolbox) for overall design of low-carbon Value-Added Services for freight and people

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1 Introduction

This document provides overall and transferable supporting tool (toolbox) for passenger and freight value-added mobility services self-assessment and design as pull measures. The document provides technical design of value-added mobility services enabling to reduce disadvantages produced by traffic restriction policies (e.g. LEZ, LTZ, pedestrian areas, etc.) to people living, working or visiting the concerned Functional Urban Areas (FUAs) and to increase business opportunities of mobility services suppliers (including sustainable passenger and freight mobility services such as carpooling integrated with public transport, green last-mile delivery, etc.).

The overall aim of the SOLEZ toolbox for value-added services is to support Public Authorities, transport providers as well as business operators in designing and set-up low-carbon mobility services at FUA level enabling to increase LEZ / LTZ / pedestrian areas attractiveness and accessibility for people and goods, well-fitting local-based needs and patterns, regulatory framework and relevant Action Plans for integration of LEZ policies and low-carbon measures in the mobility planning in FUAs.

VA mobility services are to be considered as organizational measures enabling to incentive and promote low-carbon mobility services in target FUAs as an effective alternative mobility solution to conventional fossil-fueled transport modes such as private cars, more polluting heavy commercial vehicles (HCV) and light commercial vehicles (LCV), more polluting urban and peri-urban buses, etc.

Value-Added (VA) mobility services have to be considered as pull measures being organizational interventions to encourage alternative mobility solution to common fossil-fuelled transport service.

The SOLEZ toolbox provides an overall description of most promising, innovative and effective pull measures in terms of low-carbon VA services, covering both passenger and freight transport in FUAs.

The SOLEZ toolbox has been elaborated combining top-down and bottom-up approaches in order to provide an effective and transferable technical supporting tool for relevant stakeholders (including both public and private sector) to design and implement low-carbon mobility service for target FUAs including, carpooling system (apps) integrated with public transport, promoting the use of public transport interchanges by offering value-added services, green last-mile logistics services by Urban Consolidation Centre (UCC) / Urban Distribution Centre (UDC) and cargo bike deliveries, multi-user lines (sharing of public transport reserved lines with freight traffic), Mobility as a Service (MaaS), etc.

2 How to use the SOLEZ supporting tool (toolbox)

2.1 SOLEZ toolbox for design and implementation of VA services at target FUAs

This document provides transferable guidelines for passenger and freight transport in urban and peri-urban areas by technical design and specification of Value-Added mobility services enabling to reduce disadvantages produced by traffic restriction policies to people living, working or visiting the concerned areas (FUAs) and to increase business opportunities of mobility services suppliers.

Value-Added mobility services have to be considered as pull measures being organizational interventions to encourage alternative mobility solution to common fossil-fuelled transport service.

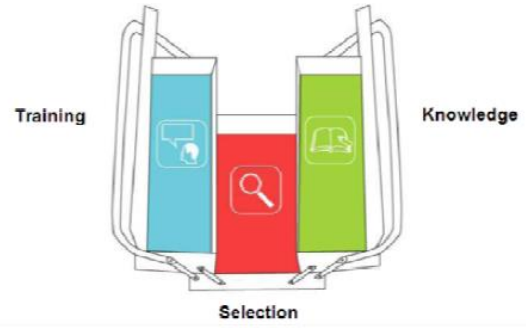


Figure 1: Toolbox for SOLEZ Value-Added mobility services design and assessment

Value-Added services design and self-assessment for pull measures implementation has been developed to enable competent Public Authorities and professionals in target FUAs to assess and evaluate technical, organizational and financial applicability of proposed mobility services well-fitting sites-based needs and patterns, regulatory/market framework and Action Plans. This document provides an overall description of most promising, innovative and effective pull measures in terms of low-carbon VA services, covering both passenger and freight transport in FUAs.

Each identified low-carbon VA service (distinguishing between passenger and freight transport) is herewith presented and in-depth analyzed based on three key issues / topics as follows:

- **introduction**
- **preliminary self-assessment (readiness level)**
- **overall technical design**

The selection of passenger and freight Value-Added services which are included in the toolbox is based on relevant technical knowledge achieved by previous and ongoing European research and development projects (within EU Framework Programme, CIVITAS, Intelligent Energy Europe, Horizon 2020, etc.) dealing with innovative and low-carbon mobility services and ICT-based solutions.

On the other hand, final selection of passenger and freight Value-Added services to be included in the SOLEZ toolbox has been achieved (bottom-up approach) through a continuative and structured consultation process implemented in the project target FUAs (feeding the elaboration of the respective SOLEZ Action Plan) through the identification, design and implementation of Value-Added services respectively in the target FUA of Vicenza, Graz, Turin, Sárvár as well as Gdansk.

3 SOLEZ supporting tool: Value-Added services / pull measures

3.1 Passenger and freight transport Value-Added services

Regulations (push measures) adopted in the SOLEZ Functional Urban Areas (FUAs) include among the others: Low Emission Zone (LEZ), Limited Traffic Zone (LTZ), Pedestrian Areas (PAs), Zone 30, etc.

Value-Added services are all about pull measures covering both passenger and freight transport as follows: car sharing services, carpooling system, traditional and free floating bike-sharing services, promoting the use of public transport interchanges by offering Value-Added services, green last-mile logistics services by electric vehicles and Urban Consolidation Centre (UCC), last-mile logistics services by cargo bikes, multi-user lines (multimodal transport corridors), home delivery and/or parking delivery of goods purchased in LEZ/LTZ/pedestrian areas, Mobility as a Services (MaaS), etc.

Passenger transport	Freight transport
Bike-sharing / green car-sharing services	Freight Quality Partnership (FQP)
Carpooling integrated with public transport (innovative apps)	Sharing of public transport reserved lines (multi-user lanes)
Innovative ICT and management services in passenger transport interchanges (P+R)	Green last-mile logistics services (B2B)
Mobility as a Service (MaaS) schemes offering combined mobility packages as a viable alternative to car ownership	Alternative eco-friendly pickup and delivery services for LEZ/LTZ shoppers (B2C)

Figure 2: Examples of Value-Added mobility services: passenger and freight transport

SOLEZ Value-Added (VA) services will be **organizational measures** enabling to incentive and promote low-carbon mobility services in target FUAs as an effective alternative mobility solution to conventional fossil-fueled transport modes such as private cars, more polluting heavy commercial vehicles (HCV) and light commercial vehicles (LCV), more polluting urban and peri-urban buses, etc.

The gradual phasing out of conventionally-fuelled vehicles (referring to vehicles using internal combustion engines - ICE) using clean and energy efficient vehicles represents one

of the key actions addressed to reach a sustainable and low-carbon transport system in FUAs, including road passenger vehicles, buses as well as freight vehicles.

The different transport modes require different options of alternative fuels: road transport could be powered by electricity for short distances, hydrogen and methane up to medium distance and biofuels/synthetic fuels, hybrid, Compressed Natural Gas (CNG) as well as Liquefied Petroleum Gas (LPG) up to long distance. The overall objective is to reduce the carbon intensity of transportation.

Russo and Comi (2012) defined sustainable city logistics as a holistic approach to city logistics, that goes beyond zero-carbon and includes social and economic aspects such as congestion and quality of life. The table below outlines the impact of different modes of transport on economic, social and environmental goals, ranging from negative (-), neutral (0) up to positive (+).

	Economic goals			Social goals			Environmental goals		
Sustainability impact Mode of transport	Traffic congestion	Delivery time	Infrastructure costs	Reduction of accidents	Reduction of vehicles	Liveability	Reduction of pollutants	Reduction of CO_2 emissions	Reduction of noise
Diesel vans (business as usual)	–	–	–	–	–	–	–	–	–
Modal shift to electric vans (low-carbon)	0	0	0	0	0	+	+	+	+
Modal shift to cargo cyles (sustainable logistics)	+	+	+	+	+	+	+	+	+

Figure 3: From low-carbon to sustainable city logistics. Based on Russo and Comi (2012)

Collaborative Economy is a major disruption. “Disruptive innovation, a term coined by Clayton Christensen (Harvard Professor) describes a process by creating products\services that addresses a market that previously couldn’t be served (a new-market disruption) or it offers a simpler, cheaper or more convenient alternative to an existing product (a low-end disruption).”

Currently the Collaborative Economy is a major disruption, which is about sharing and creating physical goods and services instead of buying new things, people are sharing products with each other in an emerging societal shift called the **Sharing Economy**. The sharing economy is recognised as a global phenomenon influencing many consumer sectors, enabling new means of connecting people to share opportunities, assets and markets. The term ‘sharing economy’ refers to a market situation in which people share among them items and use of different services or resources. In contrast to owning all required equipment (like vehicles, flats or commodities) oneself, the sharing economy is gaining more attention and acceptance as people increasingly respect an effective use of resources and demand to omit maintenance, storage, insurance and/or high operating costs.

Based on an effective bottom-up approach implemented in SOLEZ by local stakeholders’ consultation meetings - held for the SOLEZ Action Plans elaboration in the different target FUAs – by the results of Steering Committee meetings in Graz (22nd-24 th of February 2017)

and in Turin (18nd-20th of October 2017), most promising low-carbon passenger and freight mobility services selected are listed below.

- Carpooling integrated with public transport (innovative apps),
- Innovative services in passenger transport interchanges,
- Mobility as a Service (MaaS) schemes,
- Free access to public transport lanes (multimodal transport corridors),
- Alternative delivery services for shoppers (B2C last-mile delivery by cargo bikes),
- Green last-mile logistics services (B2B last-mile delivery by cargo bikes).

3.2 Carpooling integrated with public transport (innovative apps)

Introduction

Ride-sharing or carpooling is the sharing of car journeys so that more than one-person travels in a car. Ride Sharing happens mostly spontaneous, however technology is used to connect people to share their rides. The target groups of ride-sharing systems can roughly be divided into the following categories, where individuals can belong to one or several groups:

- Commuters (trips between home and place of work) with regular or varying times
- Business trips (usually during working hours and with start and finish at place of work)
- Regular everyday trips (to leisure activities for instance)
- Occasional everyday trips (to the dentist etc.)
- Shorter holiday trips (to IKEA and so on)
- Longer holiday trips (to an event or a tourist facility and so forth)

In public transport, apps have been in use for a relatively long time. Journey planners for instance, have been available in many regions for a number of years. Several research projects have already exhaustively addressed the features of the different carpooling modalities. The step ahead is the integration of carpooling services offering with public transport supply (including bus, metro, etc.).

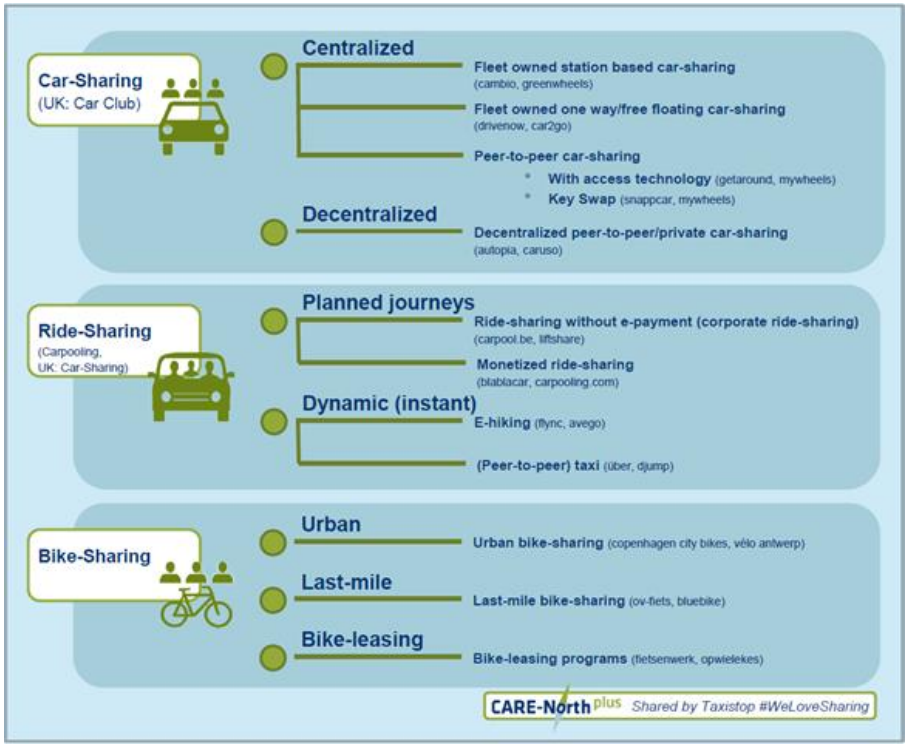


Figure 4: Classification Shared Mobility (Source: Care-North+)

Carpool success factors:

- trust
- information
- communication
- costs

Trust in the organizational structure is very important. This can be obtained through the size of the community and the frequency of use. Connection to social media allows carpoolers to use their own community to realize a shared ride. Trust related to the organization includes: size of community, reputation of the operator (link with local authority or public transport could support this), frequency of use, privacy policy, verification of user profiles, information on website, communication with organization via contact forms, or direct. Trust related to the peer-to-peer experience includes: gender segregation, personalization of user profiles (picture, link with social media, music, smoking, social media profile), user evaluation by ratings or open textual evaluation, social relationship.

Information features are another important component. If users can't easily obtain the knowledge on how to use a matching platform, this leads to uncertainty. Information features are divided into contact form, direct information given on the platform, experience reports, forum, assessment tool.

Communication facilities (e.g. direct personal messages, a blog, a discussion board, etc.) are very important for carpooling matching platforms, as they reduce uncertainty and information asymmetry existing among carpoolers when deciding on a certain platform.

Offering the website in multiple languages can further reduce bargaining and information costs because all users of the community receive all relevant information, and no one feels excluded. This is especially important for providers offering their services in different countries. Implementation of Google Maps helps carpoolers to easily check meeting points and travel route. The main motivation to carpool is to save cost.

No purchase costs are recommended. **Paid usage** (or a set amount that goes to the provider) can increase transaction costs and avoid that carpoolers decide to use this matching platform. The type of payment method can also be relevant. A variety of payment methods (cash, credit card, PayPal or direct debit authorization) might decrease transaction costs and increase usage of selected matching platform, since drivers and passengers select the most suitable payment method.

Preliminary self-assessment (readiness level)

Before the potential design and implementation of this innovative ICT-based solution enabling to offer multimodal mobility trips at urban and peri-urban level (reducing cars traffic and increasing public transport use), it is recommended to undertake a preliminary self-assessment of its applicability and readiness in the target FUAs where the VA services should be implemented.

A relevant and easy-to-use tool has been developed in the ongoing (06/2015-05/2018) SocialCar project (*Open social transport network for urban approach to carpooling)*, MG-7.1-2014 (Connectivity and information sharing for intelligent mobility). SocialCar is an Intelligent Transport System based on an innovative approach to transport demand management, and to carpooling in urban and peri-urban areas. SocialCar's main objective is developing a new communication network for intelligent mobility, sharing information of car-pooling integrated with existing transport and mobility systems.

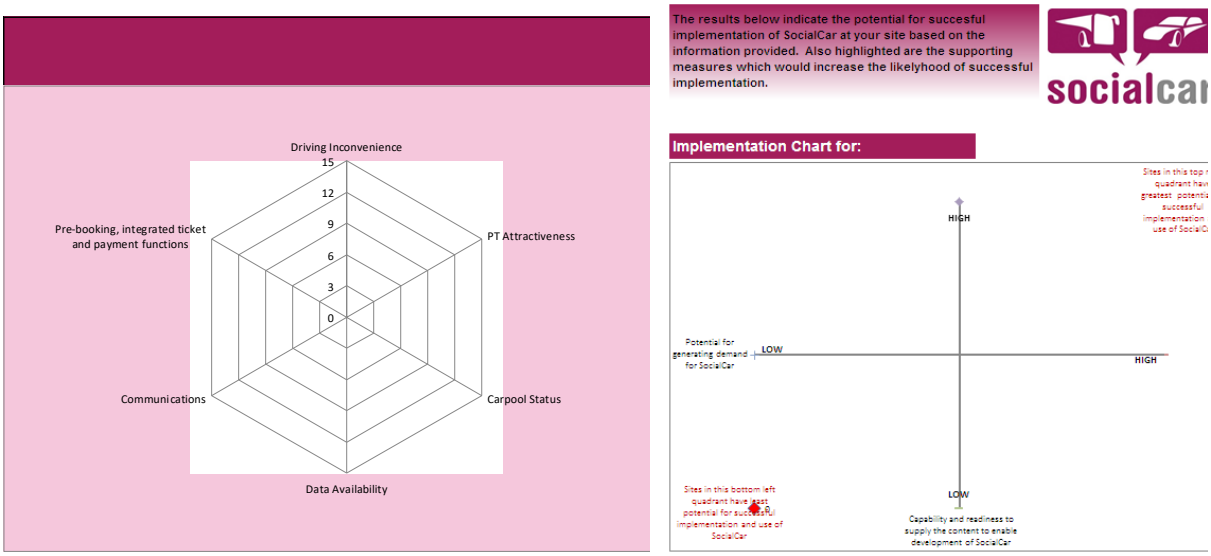


Figure 5: SocialCar Implementation Roadmap Tool (Source: SocialCar project)

Driving conditions

1) Does the city centre experience regular congestion?
2) Do the main routes / corridors into the centre experience regular congestion?
3) How often do other areas of the city experience bad congestion?
4) Are there access restrictions for private vehicles in city centre?
5) Typically, what is the difficulty of finding a parking space in the city centre?
6) What best describes the parking charges in the city centre?
7) Typically, what is the difficulty parking in the other areas of the city?
8) What best describes the parking charges in the other areas of the city?

Public Transport service provision

9) In general, how would you describe public transport (PT) services in the city?
10) In general, how would you describe PT services in the areas surrounding the city?
11) Is there high frequency segregated* services on the main corridors into the city?
12) What best describes Public Transport fares in the city and surrounding areas?
13) How are PT services provided in the city and surrounding areas?

Carpool status in your city/region

14) Regional/citywide public carpool service is provided by the city transport authority
15) A Regional/citywide carpool service is provided by a commercial operator
16) Presence of dedicated (closed) carpool schemes to employment sites
17) Overall, what best describes the carpooling schemes in operation
18) Carpooling has been tried in the past, but no carpool schemes currently operate
19) Do on-demand car services such as Uber or instant (real-time) carpooling services exist?

Data availability

20) Access to accurate static PT data
21) Access to real time PT data
22) Access to planned road network disruptions
23) Access to real time traffic/congestion data
24) Access to real time parking data
25) Access to existing carpool trip offer data
26) Access to mapping data which App developers can utilise

Communications

27) Reliability of mobile network coverage across your Region
28) Availability of free WIFI on PT services
29) Availability of free WIFI in Region
30) Use of Social Media by authorities & PT operators to communicate with travellers

Pre-booking, integrated ticket and payment functions

31) Structure of PT fares applied
32) Is PT journey fare data available?
33) What best describes the level of ticket integration between PT services
34) Is single journey e-tickets / m-tickets available to book & purchase via an app?
35) Can carpool trips be booked and paid for via an app?

Journey Planning (JP) and Travel Information Tools

36) Does the municipality / transport authority offer a well-established journey planning app?
37) Does the main PT operator offer a well-established journey planning app?

38) Is there a well-established independent travel info/journey planning app specific to your Region?

The self-assessment tool is provided in the **Annex I - SocialCar Implementation Roadmap EXCEL Tool**

Overall technical description

System architecture consists of programmable hardware elements and included software components. The **SocialCar System Architecture** includes the definition of the software components and their functionality at both ends, the detailed hardware specification of the multiplatform client side and server side, and the database deployment at the back-end.

The figure below shows the overall view of the SocialCar system architecture, the two client applications on top, the used communication protocols in the middle, and the cloud component at the bottom. The cloud comprises backend and algorithm components as backend-external services.

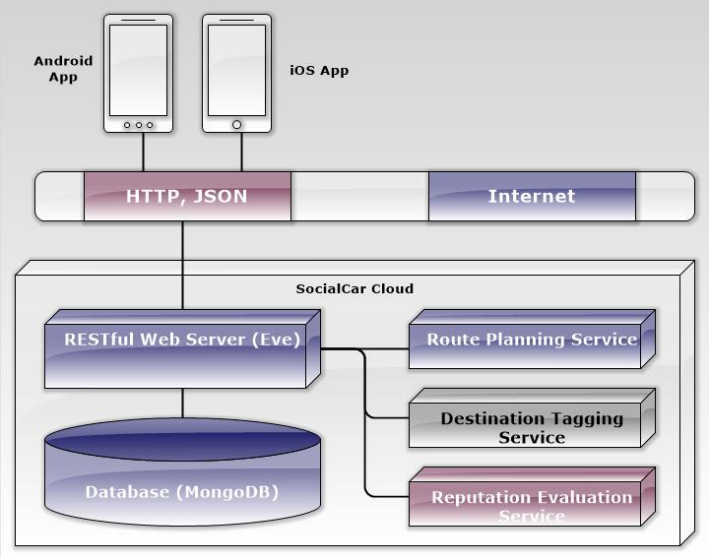


Figure 6: SocialCar Architecture overview (Source: SocialCar project)

The **frontend**, the client side, can consist of an application for Android OS and another for iOS.

Both applications include the following software components:

- User interface and controllers
- Map interface
- Location service
- SocialCar protocol
- Payment module

- Social media interfaces (Facebook, Google+)
- Authentication
- HTTP protocol

The **backend** (server side) comprises all the modules that implement the business logic of the system through a few dedicated, typically resource demanding computational processes. It provides the middleware for connecting the three main algorithmic solutions (i.e. route planning, destination tagging and reputation assessment) with the frontend, as well as the back-end services support, such as user profile maintenance and update, authentication services, database management etc.

A service orchestrator module is also part of the back-end in order to properly map any incoming requests from the frontend, to the corresponding service, or algorithmic solutions.

The implementation of the back-end modules is based on the REST design principles and the JSON format for data interchange. The back-end also manages the data stored in the database and the communication with the database server, as well as import and necessary conversion of external data sources, through appropriate wrappers. The backend platform comes with the following operating system images installed as standard on dedicated cloud VMs: Ubuntu 16.04, Windows server 2012 R2 as well as Windows 10. The server-side hardware architecture is cloud based and consists of several virtual machines. The back-end algorithmic solutions and services are hosted in the cloud as well. The backend architecture diagram provides an integrated view of all modules, as well as details on how they communicate with each other in terms of the information they exchange.

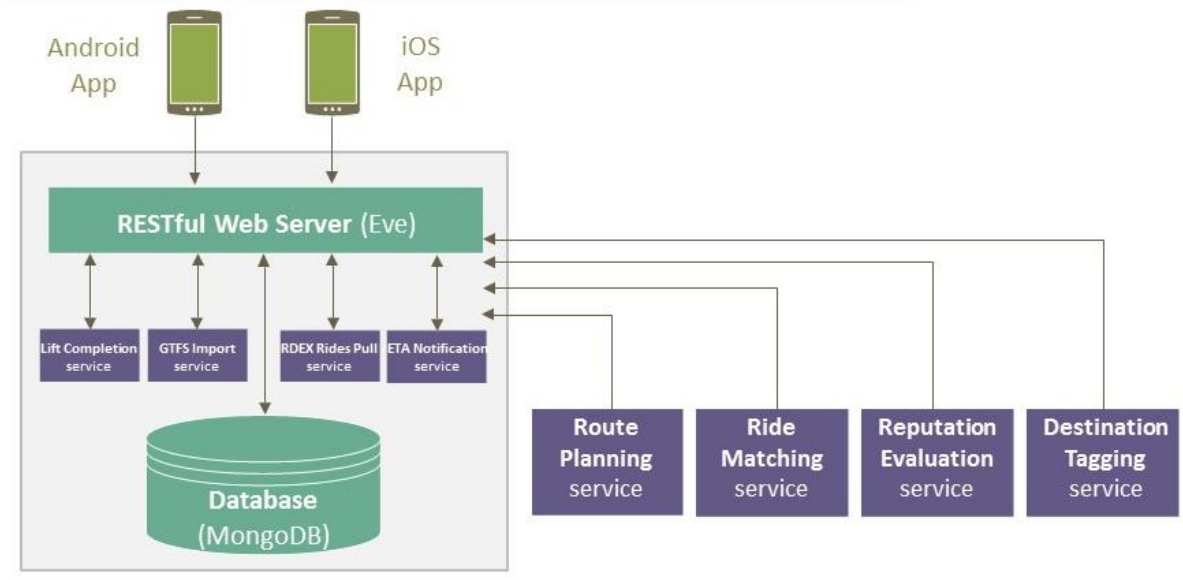


Figure 7: SocialCar backend architecture (Source: SocialCar project)

The **communication** between the frontend and the backend is built on HTTP (HTTPS when sensitive data is transmitted) and uses a proprietary protocol modelled through a REST/RPC architecture; message protocol are represented by JSON format and eventually a compressed encoding is used to optimize bandwidth usage. The communication mechanism is generally synchronous, except for push-messaging. The application uses a caching mechanism to avoid wasteful queries.

The backend acts as the pivotal point of all transport related information aggregated by the system from external sources (e.g., user positions from devices, rides from external carpool providers, etc.), or service-oriented metadata (e.g., routing results, user evaluations, etc.) stored and continuously updated within. All these raw data and metadata are then at the disposal of the core services: the *Route Planning* service aims to integrate public transport with private services including carpooling, car sharing and other on-demand services. The *Ride Matching* service is designed to distribute potential seat requests on carpooling vehicles and if needed, to dynamically assign travellers to car poolers. The *Destination Tagging* service collects and analyses user trajectories for different purposes, e.g. search for common sub-trajectories among users (travelling peers' suggestion), or identify the nature of these trajectories (home-work, work-home, home-leisure, etc.).

The *Reputation Evaluation* service helps users to decide on whether carpooling with another person or not. The aforementioned services exchange data with the backend server by using HTTP requests in a RESTful way. The *Route Planner* consists of three data sources, and eight main components:

- GTFS Database: is where all the public transport information is stored following The General Transit Feed Specification.
- DB Builder: builds the basic data base structure, reads and stores the raw text "csv" files provided in GTFS into the database.
- OSM XML File: an XML file describing the map following Open Street Map standard format.
- Carpooling Data: information about the offered carpools, such as routes, starting date and time of the trip, and maximum capacity offered.
- GTFS Parser: an interface that communicates with the database to parse the raw data and converts it into the model used by planner.
- OSM Parser: an interface that reads the XML file, and converts the raw data into the model used by the planner.
- Carpooling Parser: and interface that fetches the carpooling data and converts it into the model used by the planner.
- Road Network: contains all the information about the current state of the map, which includes road information, public transportation connections, and carpooling routes.
- Map Matcher: matches raw GPS coordinates to physical nodes in the road network.
- Spatial Tree: Provides fast access to process a smaller part of the Road Network.

- Router: contains the routing algorithm which finds a route between two given points using the desired forms of transportation.

The *Route Planner* allow multiple GTFS feeds. GTFS stands for General Transit Feed specification. It defines a common format to describe schedule, route, stop, fare, and calendar data for fixed route transit services. GTFS allows public transit agencies to publish their transit data and developers to write applications that consume that data. GTFS feed is formed by multiple files. The routes file contains information about the routes of the transit agency. The calendar and calendar dates files contain schedule information. The trips and stop times files contain information about the order of visitation of bus stops for a particular route according to a particular schedule. The shapes file contains the spatial representation of a route alignment so it can be accurately drawn on a map.

For business model development, the following objectives should be addressed:

- Minimise subsidy – revenue options should be explored in order that any requirements for public sector subsidy of the service are minimized.
- Refine a customer-oriented service – adopting a business planning approach helps to focus attention on: what are the benefits to your users that will attract them to use the service; and how are you going to communicate with users and retain them as customers.
- Build beneficial local partnerships to offer traveller incentives – business models could involve offering incentives to carpoolers (e.g. discount vouchers), based on an advertising partnership with local businesses that attract users.

3.3 Innovative services in passenger transport interchanges

Introduction

A transport interchange is considered as the driver of urban development in the neighbourhood. Larger interchanges enable to combine multiple functions, while smaller interchanges are becoming more important due to land availability and network development. Travelers need interchanges to be easy to use, accessible and comfortable. Interchange experience adds to the quality of daily living.

For the intermodal operations and information provision, smart and integrated ticketing as well as complete and integrated information (covering all available transport modes) are considered relevant key aspects. Provision of both pre-trip and on-trip information as well as individual and collective information should allow to increase intermodal journeys properly using available transport modes. The environmental footprint of transport interchanges is a key issue for environmental efficiency of interchange operations, and local energy production for energy efficient operations. Local authorities are key stakeholders with regards to environmental/energy efficiency.

Accessibility to a transport interchange by means of smooth transfers from one mode to another determines the attractiveness and a high accessibility for all users. An effective and inclusive interchange should give specific priority to pedestrians and cyclists as the most vulnerable travelers.

A lively interchange is active both during the day and night and during the entire week and year. A mix of functions and activities at different times of the day and a service offer with longer hours are essential. There should be possibilities for both activities and for resting at lively interchanges.

The NODES (*New tOols for Design and OpEration of Urban Transport InterchangeS*) tools enable every interchange manager to create a more efficient, effective and inclusive urban transport system, bringing together all elements of a clean, energy-efficient, safe and intelligent transport.

A tool in the NODES project (10/2012 – 09/2015) was defined an item or implement used to achieve an improved interchange design, building and management. In SOLEZ, the focus is about VA services as organizational measures (pull measures) enabling to incentive and low-carbon mobility solutions.

Preliminary self-assessment (readiness level)

A specific **benchmark tool** for interchanges has been developed in NODES project to allow:

- each interchange authority/operator to classify his interchanges,
- each interchange authority/operator to identify the package of performance indicators,
- benchmarking his performance in comparison with other similar stations.

Every transport interchange is at a different life cycle stage. It can be in the planning phase, even not yet been realised. It can also be an old interchange that underwent a large reconstruction. Each stage in the life of a transport interchange requires a different set of tools. Identification of interchange type is quite important for performing a preliminary self-assessment of own respective interchange.

In this respect, six (6) interchange types have been defined within the NODES project as follows:

1. *Long distance interchanges*, that are the central interchanges with build infrastructure in very large cities/wider catchment area (i.e. over 1 million in habitants);
2. *Large size interchanges*, that are the central interchanges with build infrastructure in large cities/ wider catchment area (i.e. between 200.000 and 1 million inhabitants)
3. *Second level interchanges*, that are second level interchanges with build infrastructure in very large cities/ wider catchment area;
4. *Small city interchanges*, that are interchanges with build infrastructure in small cities/ wider catchment areas (i.e. smaller than 200.000 inhabitants);

5. *Intermodal areas*, that are secondary interchanges with build infrastructure in large cities and tertiary level in very large cities/ wider catchment area.
6. *Connecting points*, that are all interchanges without physical infrastructure.

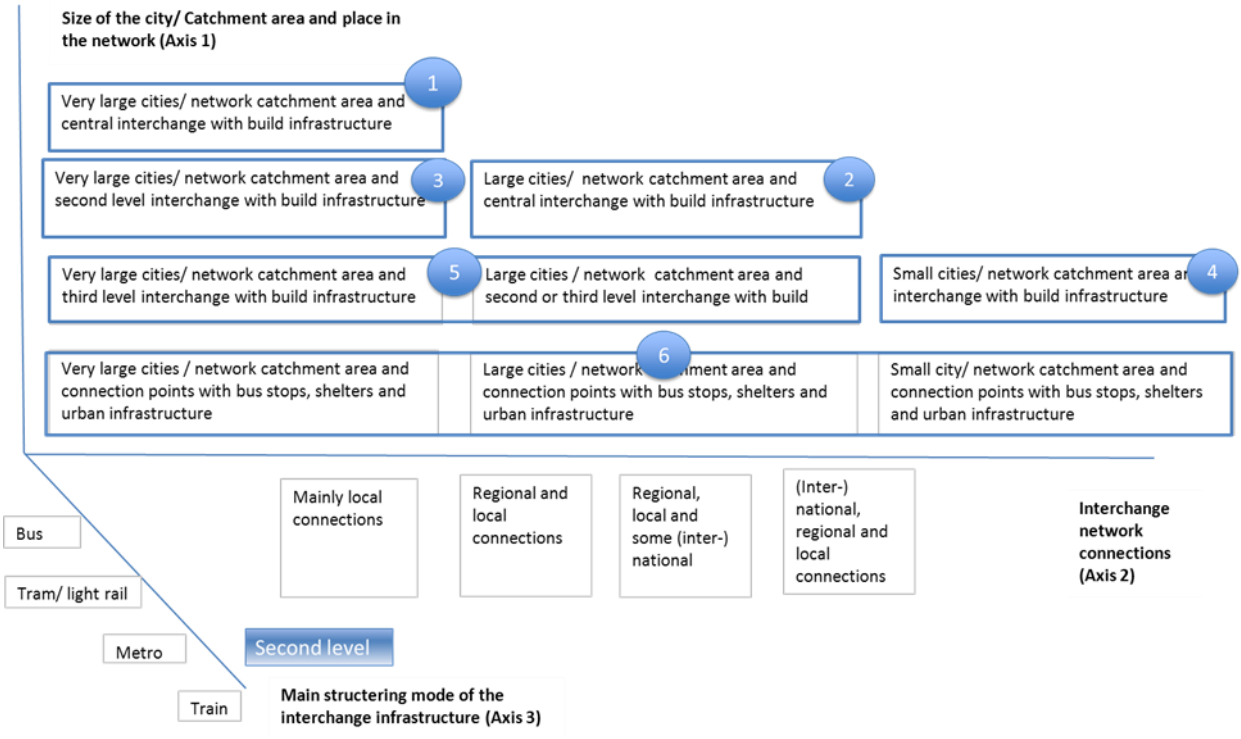
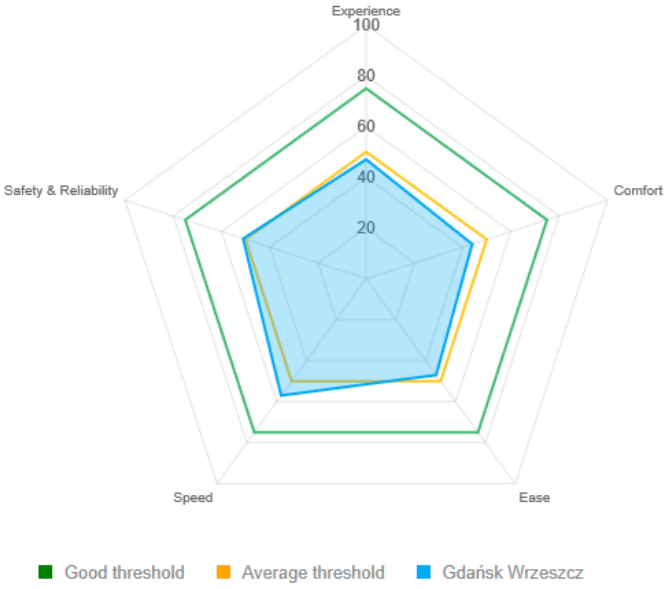


Figure 8: Transport interchange types (Source: NODES project)

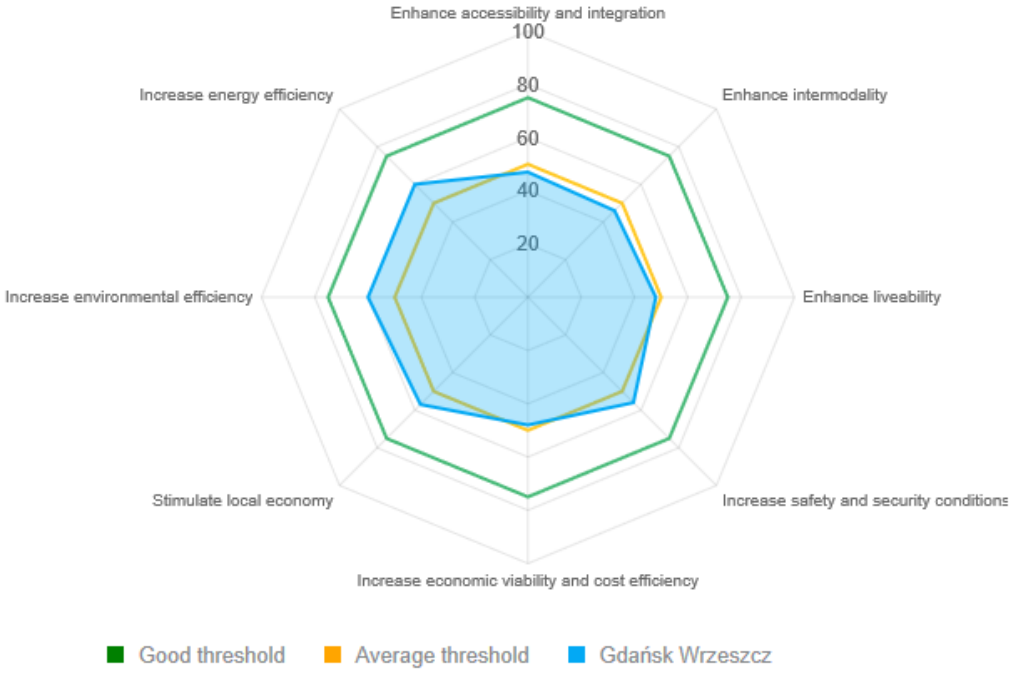
Creating an account for the NODES benchmark tool allows to benchmark the overall performance and different aspects of and interchange(s) based on specific indicators.

Figure 9: Transport interchange assessment (readiness level diagram), Source: NODES project



Experience	47%	Poor	View in toolbox
Comfort	44%	Poor	View in toolbox
Ease	47%	Poor	View in toolbox
Speed	57%	Average	View in toolbox
Safety / Reliability	51%	Average	View in toolbox

Figure 10: Benchmark Gdańsk Wrzeszcz: CUSTOMER NEEDS (Source: NODES project)



Enhance accessibility and integration	47%	Poor	View in toolbox
Enhance intermodality	46%	Poor	View in toolbox
Enhance liveability	48%	Poor	View in toolbox
Increase safety and security conditions	56%	Average	View in toolbox
Increase economic viability and costs efficiency	48%	Poor	View in toolbox
Stimulate local economy	57%	Average	View in toolbox
Increase environmental efficiency	60%	Average	View in toolbox
Increase energy efficiency	60%	Average	View in toolbox

Figure 11: Benchmark Gdańsk Wrzeszcz: INTERCHANGE OBJECTIVES (Source: NODES project)

References

https://benchmark.nodes-toolbox.eu/register/

Overall technical description

The NODES toolbox is a catalogue of integrated planning, design and management tools of whose aim is to help to build modern urban interchanges. The tools in the toolbox will allow each interchange manager to have an informed decision making, enabling an integrated and balanced realisation process from the initial planning phase of an interchange, up to the actual management of the station, surrounding area, and information provision to the traveller and citizens in the catchments area. The tools can be selected based on:

- type of transport interchange considered of use,
- the life cycle stage of the interchange,
- pursued performance objective of the interchange,
- type of stakeholder accessing the toolbox,
- type of tool searched.

The NODES toolbox linked with the benchmark tool will allow users to set targets for the performance of their new and upgraded interchange, and therewith select the right tools to reach those targets. The toolbox brings together **83 different tools** all tested within the project.

To allow the toolbox user to find the tool(s) that are best suited for his interchange(s) and local-based situation, two functionalities have been added to the toolbox. Firstly, there is a free search function. This allows finding the relevant tools based on any keyword chosen by the toolbox users. In case the toolbox user has no specific search, user can search based on a combination of characteristics of the interchange, life cycles stage and/or objectives filter and access the tools that could be of specific interest for their interchange.

The following characteristics are integrated in the toolbox:

- interchange type,
- life cycle stage of the interchange,
- pursued performance objective,
- specific type of interchange stakeholder.

In the SOLEZ project, focus is about VA services as organizational measures (pull measures) enabling to incentive and promote low-carbon mobility. Thereby supporting tools proposed for the target FUAs and beyond are mostly dealing with **"management" tools and methodologies**, enabling to offer low-carbon solutions strengthening and boosting public transport as well as sustainable mobility.

1) **Multimodal journey planner**

A trip with multiple transport modes requires a coordination of these. The interchanges are just the physical places of the change between modes. But in advance, the trips must be planned. A multimodal journey planner, which can provide timetables, routing, ticketing, reservation systems and other travel information, is a great addition. A **multimodal journey planner** enables people to view the overall journey from a starting point to their ultimate destination. A journey may use a sequence of several modes of

transport, meaning that the system must know about different public transport services available (e.g. bus, tram, metro, train, car sharing, carpooling, bike sharing, etc.) and about transportation networks (roads, footpaths, cycle routes) for private transportation (automobile, walking, bicycle). To get a good use of the journey planner, different involved parties have to participate. On the one hand, the will to bring the journey planner into a running mode has to be present. Then, the necessary data must be provided and kept up to date. At least the costs of the journey planner have to be split up between involved modes. It is very important to cooperate with IT-experts if a multimodal journey planner is supposed to be developed. Moreover, the availability of data is a crucial question for interchanges' managers to develop and improve their multimodal journey planner with information about all mobility services present at the interchange. Cooperation of the different interchange stakeholders providing their own data is essential.

Expected potential interchange's performance improvement

- improved quality of changes between traffic systems,
- faster travel speed due to reduced transition times,
- less waiting time due to optimized transition times.

References

http://www.econnect-germany.de/hubs/econnect-osnabruck/

http://www.hacon.de/hafas-en?set_language=en

http://www.vvs.de/rundum-mobil/

2) **Smart ticketing system & transport integrated fares**

Smart Ticketing Systems allow an improved, more efficient and integrated use of public transport by travellers, while they enable transport operators to better collect a great amount of data which may play an important role to develop and innovate ways of management. Contactless card that allows:

- quicker, more comfortable accesses,
- different kinds of tickets charged electronically within a single physical card,
- good example of new possibilities is restitution of tickets in case of loss or theft,
- improve management, marketing and transport planning thanks to a new database.

In addition, integration of all transport services into one single ticket (valid for any transport mode) is quite crucial for successful interchange management. This is crucial to promote an easy-to-understand, attractive public transport system. Integrated fares make the whole travelling experience simpler and easier, thus more attractive. They make possible easier transfers, which is crucial to achieve a seamless trip experience. Travellers

can get tickets without knowing the distribution of their trips per modes, so they perceive the system as more reasonable and attractive.

Expected potential interchange's performance improvement

- quicker, more attractive and simple travel experience with impact on travel demand,
- boosting system integration and inter-modality,
- It makes possible other good practices such as tickets-selling at one-point, multi-modal spaces (waiting areas, etc.) or complementary facilities (park&ride, car sharing, etc.).

References

http://www.tfl.gov.uk/fares-and-payments/oyster

http://www.navigo.fr/

http://www.tisseo.fr/les-tarifs/obtenir-une-carte-pastel

http://www.crtm.es/servlet/RedTransServlet?xh_ACCION=1&xh_TIPO=7

http://www.crtm.es/red_transportes/tarifas/red_tarifas.jsp?CODPANTALLA=1&CODBOTON=203

http://www.londontravelpass.com/http://www.tfl.gov.uk/fares-and-payments/oyster

http://www.ratp.fr/fr/ratp/c_20585/titres-tarifs/

3) Business case for Park & Ride facilities

Business cases for different modes of passenger transport or funding streams have their own set of circumstances and demands for detail which can make the underlying process of decision making opaque. To ensure decision makers receive the right information on which to draw their conclusions, all investment decisions are required to follow the same high-level process. This allows for objective comparisons of proposals for investment within and between projects and modes. The land owner investigates the most appropriate business case, to operate Park and Ride (P&R) facilities near or at the interchange. The facilities can be managed in several different ways:

1) Management by the transport authority; this can facilitate integration with other modes (public transport, bicycle);
2) Management by a mixed public-private partnership;
3) Sub-contraction to a private entity.

P+R should intensify the use of public transport and minimize the traffic volume in the inner city:

- No P+R terminals within the main circular road,
- P+R should be located as close as possible to the home of the user,
- Small and middle-sized P+R terminals (up to 300 – 400 spaces) for regional demand,
- big terminals at the city boundary for national demand.

Basis for the parking fees should be the distance to the city centre (the closer to the centre, the higher). In this way, the environmental result of P+R is improved, because fees lead users to switch earlier to public transport. Parking fees contribute to reduce municipalities' financial burden.

Expected potential interchange's performance improvement

- increase the attractiveness of an passenger transport interchange,
- smooth connection with the public transport means served at the interchange,
- ensuring of safety and security both for users and vehicles.

References

http://www.ashford.gov.uk/park-and-ride-study

http://lara.inist.fr/bitstream/handle/2332/1678/CERTU-RE_10-07.pdf?sequence=1

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/85930/dft-transport-business-case.pdf

http://www.trm.dk/~/media/files/publication/2012/traengselskommission/konference-den-1-oktober-2012/2-angelika-deisenrieder.pdf

4) Business case for the integration of bike-sharing and car-sharing services

The overall objective is to help landowner evaluation of the availability of **bike-sharing and car-sharing facilities at passenger transport interchange** as well as potential for contractual agreements with sharing mobility service provider. It supports the investigation of the most appropriate business case to integrate bike and car-sharing services at the transport interchange. Bike and car-sharing facilities can significantly increase the available opportunities for transport at a passenger interchange. The drop-off point location and the network coverage are crucial factors for the success and cost efficiency of the scheme. The facilities can be managed in several different forms such as:

1) Management by the transport authority to facilitate this integration of public transport with soft modes and alternative modes such as car sharing, carpooling, etc;
2) Management by a mixed public-private partnership;
3) Sub-contraction to a private entity.

Car-sharing and bike-sharing services are mobility services intended for city dwellers. While the bike share services target short duration and short distance travel, car-sharing may respond to travel needs that go from 30 minutes to 48 hours, either covering short or longer distances. These services are complementary to the public transport network. The stations are located in public spaces, especially at interchanges or close to major tramway or metro stations. Access to car-sharing requires prior registration. The bike-sharing service can be used by anyone with a credit card.

To offer an increased number of modes of sustainable transport to users, local authorities are contributing to the integration and financing of bike and car-sharing services through contractual agreements between real estate owners and the service provider in the form of subsidies by making real estate available or by taking part in the construction.

Concerning integration of **bike-sharing services** more specifically, the Transport Organising Authority could sign an advertising contract requiring the service provider to pay royalties for use of public space through an agreement for temporary occupation of public space. In terms of time for implementation, one year should be counted as from the government (advertising) contract being signed and one year of initial works (then the time for the construction of new stations over the following months/years). Concerning integration of **car-sharing services,** generally through the creation of a co-operative society of members and subscribers, two years of studies need to be counted and one year to implement the provision (then the time for construction of new stations over the following months/years). Two types of bike and car-sharing services co-exist as follows:

- **stationary service**: pick-up and return bike/vehicle to the same parking space;
- **free-floating service**: pick-up bike/vehicle from parking space A and return it to parking space B or pick-up and leave bike/vehicle everywhere based on GPS tracking system.

Moreover, it should be noted that the electrical distribution operator is to be involved if car-sharing service includes hybrid electrical vehicles or making charging stations available for electric vehicles.

Key issues can be identified for local authorities when implementing public bicycle sharing schemes including limitation of operating costs, reduction of exposure to risk of vandalism, reduction of maintenance and control costs as well as proposal of an integrated transport offer. Some conditions to be met for success are: i) A dense network of cycle stations, ii) Fleet size of at least 150 bicycles; iii) efficient service and communication; iv) total cost of service to include the number of journeys generated plus theft and vandalism risk.

Expected potential interchange's performance improvement

The integration of bike and car-sharing services can increase the attractiveness of a transport interchange by offering an increased number of transport modes (pull measures) at the interchange.

If well managed and properly rated, the bike-sharing / car-sharing service will:

- increase customer fidelity to a combined mobility offer (tram + bus + bike + car sharing etc.) information availability, pricing, ticketing and marketing,
- generate new trips with very low carbon footprint,
- complete the PT offer in time (24/7 service) and space (where the PT offer is low),
- attract new customers to combined mobility (students, young people, car drivers switching to e-bikes etc.),
- increase the catchment area of stations.

References

http://mobilpunkt-bremen.de/index.php/english/

Toulouse car sharing scheme

Toulouse bike sharing scheme

5) Station Experience Monitor

The overall objective is to measure passenger station experience. Most interchanges are having a functional design. The lack of considering the users' travel and waiting experiences is often obvious.

The **Station Experience Monitor (SEM)** is used in the Netherlands, UK and several interchanges across Europe to measure passenger station experience. The experience at the larger stations are measured every three months, the smaller ones, once a year.

At every station, passengers are selected randomly when waiting at the stations platforms. To have a good overview of the experiences during peak and off-peak hours it is recommended to have about 300 questionnaires filled in total per station. Besides larger refurbishment and redesign of the interchanges, it was found that often very simple low-cost interventions can already have a large impact on the waiting and travel experiences of the interchange users.

The questions and weightings are based on a long experimenting of the tool over time. The present instrument allows a correct analysis and appreciation of results.

The SEM is a valuable and helpful standard instrument for measuring, monitoring and comparing customer experiences on a European level. The SEM was successfully applied at 12 different stations in 7 cities (Madrid, Rome, Budapest, Birmingham, Reading, Toulouse and Thessaloniki).

Expected potential interchange's performance improvement

The SEM helps to identify interchange performance in respect to customer experience. It gives an in-depth insight in what the travel really wants. It allows the management to steer interchange performance on what really matters, as to say the customers' experiences and needs.

References

https://nodes-toolbox.eu/tools/customer-stakeholder-satisfaction-evaluation/

3.4 Mobility as a Service (MaaS) schemes

Introduction

Mobility as a Service (MaaS) is a mobility distribution model in which customer's major transportation needs are met thanks to one single integrated service provider combining transportation infrastructures, travel information, payment services and more[1]. MaaS provides a new way of thinking in terms of how the delivery and consumption of mobility is organized and managed.

Why Mobility as a Service? MaaS will enable to reduce the use of private cars with direct impacts in terms congestion and parking as well as to reduce emissions produced by conventionally-fuelled vehicles (referring to vehicles using internal combustion engines - ICE). Furthermore, MaaS will enable to highly reduce the need for 2nd private car as well as to enhance first/last-mile accessibility.

MaaS is a new concept aiming to provide consumers with flexible, efficient, user-oriented and ecological mobility services covering multiple modes of transport on a one-stop-shop principle. MaaS could offer multimodal route planners and different services under one fare and on the same ticket[2].

MaaS is all about multimodal passenger transport, shared mobility, multimodal traveler information, integrated booking/ticketing/payment, etc. MaaS is fed by scheduled public transport services, public/private parking, private sharing mobility services, on-demand public transport services, etc.

What is Mobility as a Service? Many varying definitions are available as follows:

1. **The original definition** stems from Sonja Heikkilä's master thesis from **2014** in **Helsinki**:
   "Mobility as a Service (MaaS) - a system, in which a **comprehensive range of mobility services** are provided to customers by mobility operators."
2. **Working paper from the Swedish knowledge centre on public transport K2:**
   "Integrated mobility service" (IMS) to describe a service that not only

[1] Source: M, FINGER (2015) 'Mobility as a service: from the regulation of transport tot the regulation of transport as a service', European Transport Regulation Observer).
[2] Source: http://www.vtt.fi/sites/maasifie

integrates a range of mobility services, both public and private, but also provides **one-stop access to all services through a common interface** (hence creating a seamless customer experience, i.e. the service)."

3. **Article on transportation services:** "Buying mobility services as **packages based on consumers' needs** instead of buying the means of transport. Via 'Mobility as a Service' systems consumers can **buy mobility services** that are provided by the same or different operators by using **just one platform and a single payment**."
4. **S. Hietanen, CEO of MaaS Global Oy (2014)** describes MaaS as: "A mobility distribution model in which a customer's major transportation needs are met over one interface and are offered by a service provider. … The central element of Mobility-as-a-Service requires a mobility platform that offers mobility services across modes".
5. **MaaS definition by MAASiFiE (2016) -** "Multimodal and sustainable mobility services addressing customers' transport needs by integrating planning and payment on a one-stop-shop principle".

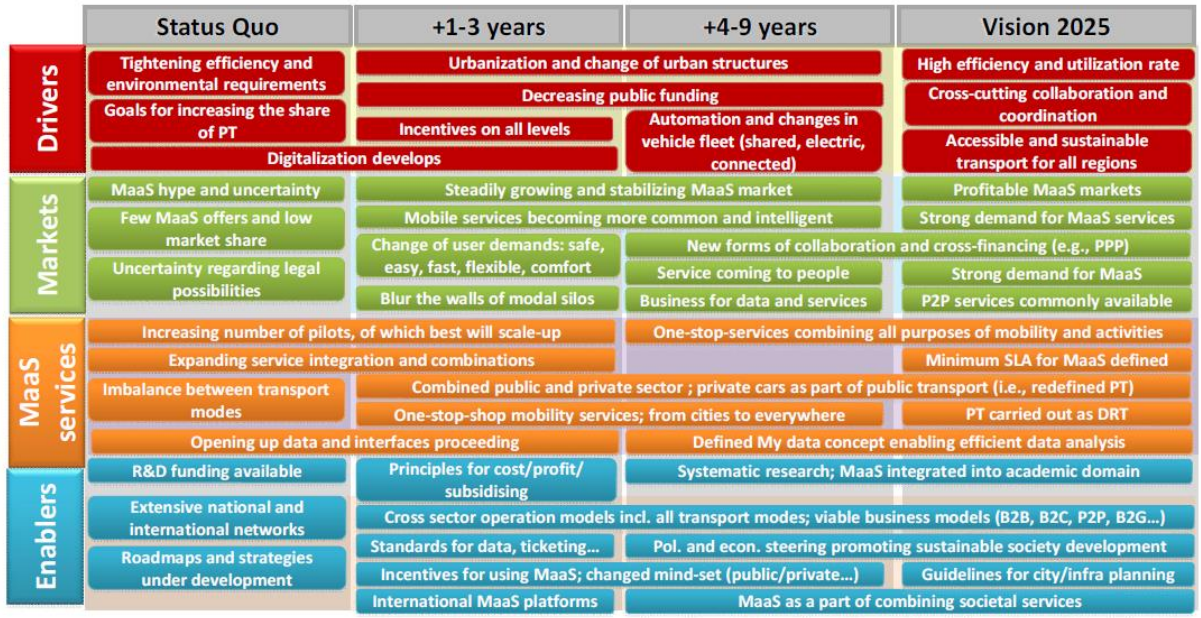


Figure 12: European MaaS Roadmap 2025
(Source:http://www.vtt.fi/sites/maasifie/PublishingImages/results/cedr_mobility_MAASiFiE_deliverable_2_revised_final.pdf)

MaaS comprises the following three main components that enable integrated mobility services:

- shared mobility,
- booking/ticketing,
- multimodal traveller information.

Shared mobility is needed to intensify the transport system by reducing the number of private cars commuting daily on the road network, and promoting alternative options like carpooling, ridesharing or bike sharing as first/last-mile options. The aim is to reduce the number of 'second car'-households (or ideally even some 'first car'-households) and enable a seamless transition from individual to multimodal public transport without needing to own a private car. ICT technology and especially the provision of smartphone or web-based applications can facilitate an easier access to available, shared mobility resources and services.

Booking/ticketing is also an integral part of MaaS. With more sophisticated ticketing, the customer experience can better meet customer expectations, which can foster co-modality and intermodality.

In this respect, ticketing could contribute to the overall improvement of the transport network level of services and accessibility, with the main aim to facilitate and increase the use of alternative transport and contribute to the overall sustainable transport goals.

Ticketing as a MaaS component especially requires integration with other MaaS service components to be effective. Finally, individualized **multimodal transport information** provided by integrated and multimodal traveller information services via web-based and app-based solutions is a key factor for seamless door-to-door multimodal mobility. Some services incorporate for instance: real-time information on public transport schedules, routing information for different transport modes, including journey times, fares or even information on sharing facilities.

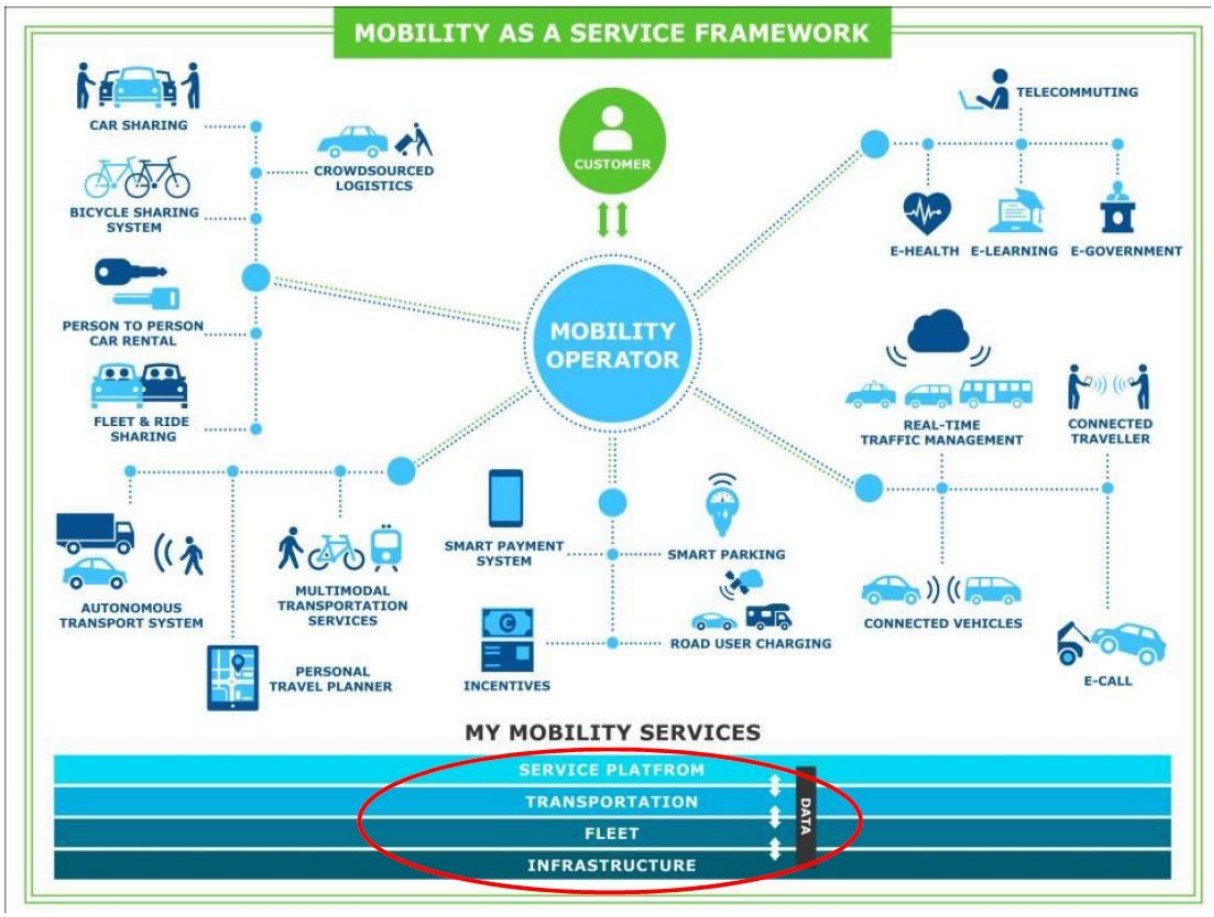


Figure 13: MaaS framework (Source: The Ministry of Transport and Communications of Finland)

As the deployment of MaaS strongly relies on the provision of ICT technologies, the focus within this document is on the related requirements. In this respect, already employed technologies within MaaS and MaaS-related services have been identified and described for effective design of MaaS.

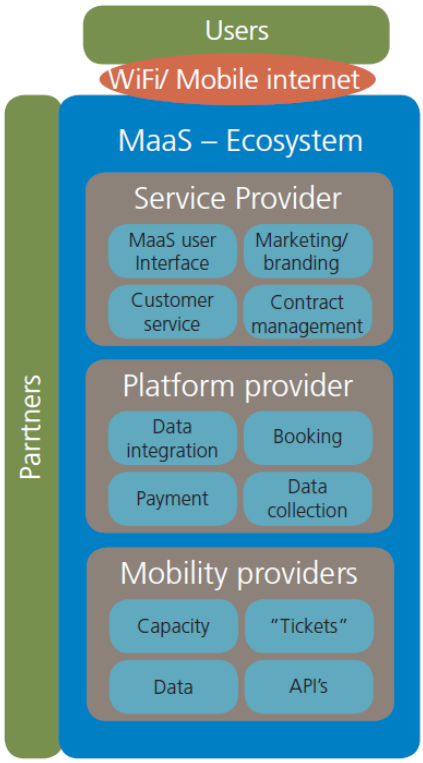


Figure 14: The MaaS ecosystem. Source: Adapted from Movia notat 2016-08-18

Preliminary self-assessment (readiness level)

Before the design and implementation of this innovative ICT-based solution enabling to offer MaaS at urban and peri-urban level, it is recommended to undertake a preliminary self-assessment of its applicability and readiness in the target FUAs where the VA services are planned be implemented.

The **MaaS Readiness Level Indicators Framework** was developed within the CIVITAS ECCENTRIC project (2016-2020) where Madrid, Stockholm, Munich, Turku and Ruse are working together to tackle the challenges of mobility in suburban districts and clean, silent and CO2-free city logistics.

- **MaaS readiness level indicators** highlight the different aspects of MaaS development that are identified to showcase the local authorities' current situation for establishing MaaS in the local context;
- **Readiness level indicators** are aimed as a starting point for local authorities;
- MaaS readiness level indicators give a cross-sectoral view on how prepared each local authority is for the change and what sort of decisions it has already made regarding transportation and how these supports the implementation of the new transport services.

MaaS indicators consist of eight different components:

- **Strategic readiness**
  - Strategic focus
  - Parking policies
- **Internal use**
  - Travelling guidelines
  - Use of shared mobility
- **Shared use**
  - Shared economy
  - Public transport
- **Shared understanding**
  - Integration platform
  - Visibility

STRATEGIC READINESS
Strategic focus
Parking policy
INTERNAL USE
Travelling guidelines for the staff and politicians
Use of shared mobility within local administration
SHARED USE
Shared economy - availability and market penetration of shared and combined travel options
Public transport (PT)
SHARED UNDERSTANDING
Integration Platform
Visibility - how obvious and easy to get are the shared mobility offers to the citizens

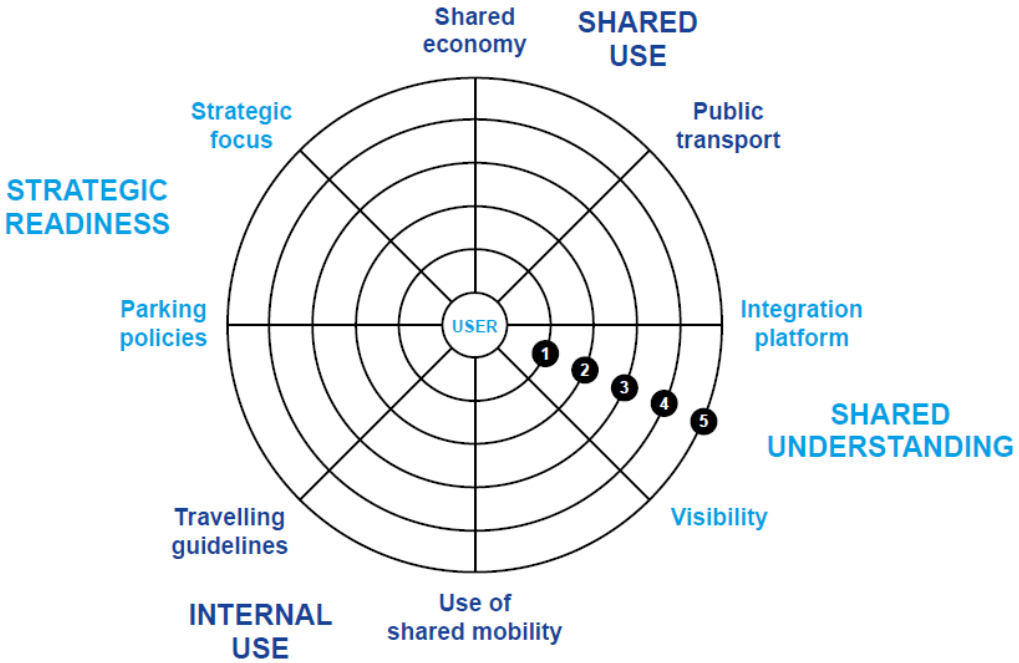


Figure 15: MaaS readiness level diagram (Source: CIVITAS ECCENTRIC)

- **Strategic readiness**
  - Strategic focus
    1. The local authority has no measure taken to explicitly support MaaS development in the city
    2. The local authority is involved in measures to support the development of mobility services together with the service-providers and/or incentives are used for creating the Maas
    3. The local authority has a plan/strategy/policies to explicitly support the development of MaaS in the local context
    4. The local authority has local funding to support the change (project or continuous funding)
    5. The local authority has a named person to be in charge of MaaS development. The local authority develops MaaS systematically
  - Parking policies

    1. The local authority does not have a parking policy
    2. The local authority has a parking policy, but it does not explicitly support the shared use of vehicles and/or transport on demand
    3. Politicians are ready to change parking policy on critical areas in the local authority or they are ready to take measures to reduce private motoring/ car ownership
    4. The local authority is active in supporting new business models by adapting parking standards for (new) residential developments (reducing the area of parking space, allocating parking spaces for shared cars/transport on demand and enabling new mobility services for residents)
    5. The parking policy supports shared cars by offering priorities/cheaper parking/parking zones for shared vehicles and parking permits are easy to acquire

- **Internal use**
  - Travelling guidelines for the staff and politicians

    1. Internal travelling guidelines for staff and politicians of the local authority do not prioritize sustainable mobility
    2. Internal travelling guidelines prioritize sustainable mobility, but are not monitored by the local authority
    3. Internal travelling guidelines prioritize sustainable mobility and travel patterns are monitored and reported annually by the local authority
    4. Internal travel instructions prioritize the sustainable mobility, travel patterns are monitored annually by the local authority and there is a clear plan to reduce the use of private cars on work travel and to promote the use of shared mobility
    5. Internal travelling instructions prioritize sustainable mobility, travel patterns are monitored annually, the use of private cars on work travel has declined during the past 3 years

- Use of shared mobility

1. The local authority is not using shared mobility services itself
2. The local authority offers shared cars/bikes etc. for the use of its staff and politicians, but it is limited to a small number of employees
3. The local authority offers shared cars or bikes for the use of the majority of staff and politicians
4. The local authority uses shared mobility services offered by several service providers
5. The local authority uses shared mobility services offered by several service providers, not limited to working hours only

- **Shared use**
  - Shared economy

1. There are no companies offering shared vehicles in the local authority
2. There are pilots/campaigns/incentives taking place in the local authority regarding shared mobility options
3. There are different kind of shared mobility opportunities offered by companies available for citizens
4. There are more than five different kinds of MaaS operators providing combined mobility within the local authority covering the following modes: public transport, shared vehicles, shared bikes, ride sharing, rental cars, taxis, rental boats etc.
5. Regular service providers (grocery stores, theatres, estate developers and housing companies etc.) work together with MaaS operators and offer package deals to their customers

  - Public transport

1. Customers can buy local PT tickets only via PT service providers' own channels, which differ from each other
2. Customers can buy the tickets to PT through several sales channels offered by third parties
3. The public transport authority (PTA) is actively connecting with other MaaS operators/transport providers in the area and they have plans to offer package deals to customers. (bicycle/car sharing, carpooling, taxis etc.)
4. The PTA already offers multimodal package deals with other MaaS operators to customers
5. Hotels, theatres, shopping malls etc. regular service providers offer several service packages combining PTA with their own services

- **Shared understanding**
  - Integration platform

1. The local authority has not opened data gathered from public transportation operation

2. PTA and the local authority have opened data/standardized information gathered so that third parties can use it to create new apps and services
3. "Third parties already use open data and provide mobile applications (with information about one mode of transport or more than one, real time information, information about other services, official public transport applications etc.)"
4. The local authorities are promoting and facilitating a cooperation between different providers by any means (technical exchange platform, standardizations, etc.)
5. Third parties work together to sell their MaaS services by using the same apps as other private and/or public MaaS operators. The app may be provided by the PTA or a private service operator

– Visibility

1. Customers can find multimodal (min. 2 modes of transport) traveller information
2. Customers have several channels from which they can find multimodal traveller information
3. Customers get visuals or see campaigns on sustainable mobility options/MaaS services while travelling in the city
4. Customers can change their means of transport easily in several places within the local authority (min 4 transport means in one place)
5. Customers have found MaaS services and their usage has increased within the last year

References

The self-assessment tool is provided in the **Annex II - MaaS Readiness Level Indicators**

Overall technical description

Even though MaaS has a strong orientation towards the implementation of new business models and requires new organisational concepts, technology is an important enabler in order to provide citizens with access to public and private real-time mobility services.

The most fundamental requirement for the provision of MaaS services is the provision of data for generating final end-user and transport operator services. With the number of available sensor data sources and with the level of data integrity, high-quality services can be achieved. Commonly used data formats facilitate the integration and exchange of different data and information content.

Service requirements mainly deal with the **provision of common and open interface concepts**, allowing service providers to contribute to a jointly operated MaaS system. While data requirements focus on the provision of a common basis for embedding different data and information sources, service requirements concentrate on the provision of

harmonized and agreed-upon information exchange and interface procedures, including usability requirements.

Accessibility to end-user devices is required for consuming final MaaS services and allows the provision of real-time interaction between end-users (travellers) and producers (e.g. transport operators and/or service providers). Wireless networks, especially, provide a key enabling technology fulfilling the physical requirements. For instance, the evolvement of 5G and 4G/3G mobile network technologies together with the integration and expansion of local wireless communication networks (e.g. WLAN and Bluetooth) pave the way towards a seamless access environment to MaaS systems.

Legal requirements influence general framework conditions and thus contribute to regulating use of different technologies for MaaS. Under these circumstances and wherever information was available, **legal requirements in terms of data security and privacy** are studied in more detail. Usability requirements focus on the user needs, which must be tackled by the MaaS service, e.g. user interface design, accessibility and ease of use considering different user group needs.

MaaS can be presented in different ways with different technologies and in different formats to end-users: in this respect, web-based technologies represent a key driving technology for the provision of MaaS services. Technical MaaS system architecture is based on the use of web technologies.

The proposed system architecture provides an overview of the technical MaaS system and related operations, but for sure it might be other technical solutions available and used that fulfil the same requirements. Nevertheless, there is a strong focus on using internet-based technologies, the use of mobile web-based devices like smartphones or tablets, as they already have a high penetration rate and enable cross-linking of different services, including common payments.

The system architecture analysis systematically links to the organisational background of the corresponding MaaS system. In other words, processes and technologies required for final MaaS service provision are highlighted in the technical system architecture, as presented in the Figure 16.

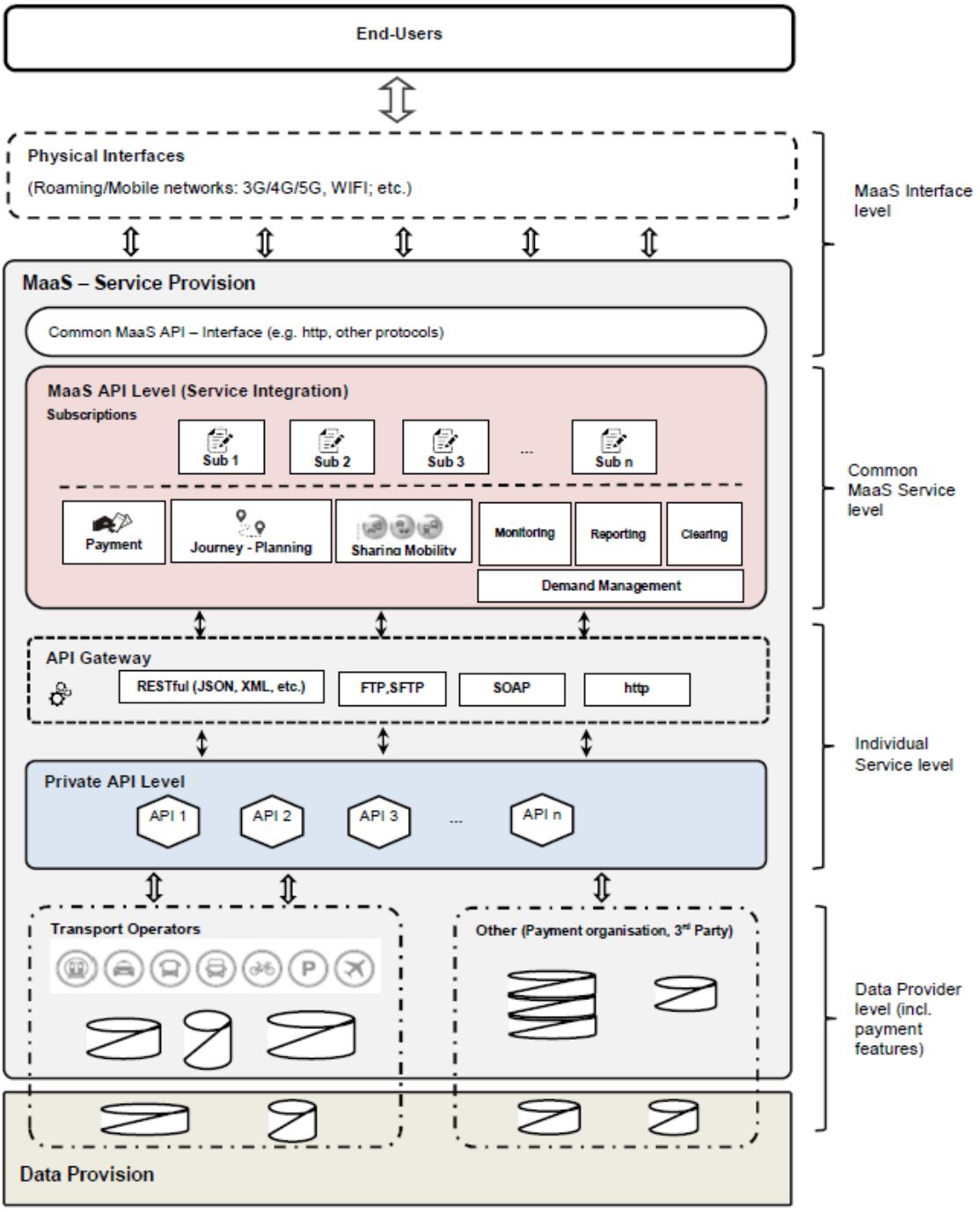


Figure 16: Technical MaaS system architecture (Source: MAASiFiE project - Deliverable 5: Technology for MaaS)

The main MaaS domain is represented by the new layer of the **MaaS API (service integration)**. From the current perspective, only some existing (mobility) service providers allow the integration of different subscriptions on a commonly provided end-user application. Besides the availability of end-user service features like booking, sharing or

journey planning, within the MaaS API level, several new administrative aspects arise with integration, covering mainly demand management issues.

From the current perspective, several different mobility services/applications coexist that have no interfaces/connections among each other. The standalone, proprietary services are highlighted in the blue box (Figure 16), referred to as the Private API level.

The **Private API level** presents the sum of all available mobility services being potentially made available on the digital service markets and used for instance directly by travellers already. These services might be provided for instance by transport operators being in the role of service providers as well. Depending on the applied role model, some transport operators might act as both data and service providers therefore they are represented on both data and service level sites.

Payment service provision requires billing and clearing between different stakeholder organisations (e.g. done via the MaaS operator) and information/booking and validation of user accounts. Mostly third-party payment providers offer their add-on service features.

To connect different services to one common access platform, technical service interfaces are required to gather all available content/information sources. Figure 16 shows the **API Gateway** describing some interface examples using web-service based distribution technologies. For instance, Restful (Rest), simple HTTP, and/or SOAP specify when to access/exchange data between different sites. All those web-service technologies are mostly implemented as part of back-end systems.

Since end-users interact only with the MaaS service front-end system, back-end systems need to be established between different data/service contributors. Regarding **MaaS data provision**, several data sources form the basis providing high quality MaaS services.

In most cases, transport operators provide their own data and contribute to the digital MaaS architecture with their own ‘opened’ services or act as data providers. In some other cases, third parties or service providers are providing their data. Provided data might for instance cover real-time information on schedules, information on stop locations, locations of Point of Interests, road network information, and/or road/public transport event information (e.g. traffic messages on incidents).

For both road and public transport-related data/information provision, different data standards are available. Closely related to the technical characteristics of MaaS defined by the system architecture, a platform-based model for MaaS is suggested. Depending on the business model arrangement, platforms can be supervised by separate platform service providers, by transport/infrastructure operators, or by the mobility service providers. **Wireless communications** form the basis for realising MaaS services. They allow using the services almost everywhere at any time. Wireless networks are heterogeneous with respect to capabilities, coverage area, terminal to be used and usage cost.

3.5 Multi-users lanes (priority bus lanes sharing with freight vehicles)

Introduction

Freight vehicles picking up and distributing goods at urban level are allowed free access to public transport priority lanes (*free access to public transport lanes*). Vehicles need to meet certain criteria set by the city administration to qualify for access, offering an incentive towards cleaner vehicles.

To optimise the use of available street space, multi-functional lanes are introduced. Using VMS (Variable Message Sign) technology, lanes can be designated for varying types of traffic and/or parking at various times of the day, including a "slot" for goods deliveries (*multi-user lanes*).

Free access to public transport lanes starting from less polluting and heavy freight vehicles might encourage promotion and usage of Environmentally Friendly Vehicles (EFV) in urban freight - encouraged by several urban authorities and national governments across Europe - since important developments on low emission vehicles (e.g. hybrid vehicles, etc.) have already been achieved. Many municipal and national activities started to encourage the use of EFV in urban freight transport.

Within Barcelona, three lanes are used as "multi-use lanes" installed with VMS technology which clarifies who is allowed to use the street (residents, deliveries) according to the time of the day.

The city of Turin is implementing the **multi-users lanes** concept, including effective access management of recognized freight vehicles in public transport bus lanes while maintaining an acceptable level of service for the whole PT system. The goal is to reduce emissions for freight traffic.

For what concerns the multi-users lanes, the sharing of such high-speed lanes between PT and logistics operators was envisaged in the Freight Quality Partnership (FQP) signed in 2013. Then it followed a real-life pilot involving initially a fleet of 20 vehicles that took advantage from the use of the so-called Olympic lanes (high-speed lanes developed for fast movement of referees and athletes during Winter Games 2006). The pilot involved key express courier companies that deliver in LTZ[3].

The results collected from on board units of recognised freight vehicles have been very promising so that the City Administration decided to test the possibility to extend the use of reserved lanes to the PT lanes. This cannot be tested in real life immediately and that is the reason for the development and implementation of a pilot based on model simulation. If the inclusion of freight vehicles in PT lanes network will not affect the level of service of buses (e.g. commercial speeds, etc.), it will be implemented at full scale in real

[3] TNT, DHL, UPS, FEDEX, SDA, GLS, BARTOLINI

environment. In the SOLEZ project, City of Turin will continue and enlarge the NOVELOG experience[4], including electric and Natural Gas-Powered (CNG) vans.

Preliminary self-assessment (readiness level)

Free access to public transport lanes

- **Category of the measure:** Organizational
- **Policy design of the measure:** Initiated/supported by public administrations.
- **Involved stakeholders:** Administrations, Freight carriers, Shippers.
- **Possible barriers:** Possible concertation and cooperation obstacles: there may be concern from bus operators that allowing other vehicles into priority lanes will slow down journeys and reduce reliability. Cyclists may be concerned about adverse effects on safety from allowing large lorries into priority lanes.
- **Innovativeness:** Many cities already allow freight vehicles to use priority lanes.
- **Driver for success:** Active input and participation from all stakeholders.
- **Transferability:** Transferrable to any town/city where priority lanes are in place.

Multi-user lanes

- **Category of the measure:** Organizational
- **Policy design of the measure:** Initiated/supported by public administrations.
- **Involved stakeholders:** Administrations, Freight carriers, Shippers, Residents.
- **Possible barriers:** Possible financial obstacles: Need for investment in VMS systems to regulate the multi-user lanes, plus necessary enforcement staff. Possible technical obstacles: Important to ensure that all users respect and obey the designated timeslots. Failure to effectively enforce the system will result in it being abused and ignored.
- **Innovativeness:** Although priority lanes are widely used, we are not aware of any other cities which operate timed multi-user lanes of this kind.
- **Driver for success:** Availability of necessary infrastructure. A legal basis must exist or can be adopted for designation of multi-user lanes. Effective enforcement is critical so that the measures are respected by all users, especially at the beginning.
- **Transferability:** The measure is replicable, but requires investment in VMS systems, signage and sufficient enforcement staff.

Common *strengths* are herewith presented for free access to public transport lanes/multi-user lanes.

- bus lanes are an efficient use of road space, because less vehicles circulates for them;
- a study of existing bus lanes in Norwich (UK) was undertaken to determine the most suitable lanes for heavy goods vehicles to use. It might be decided to allow only heavy goods vehicles (HGVs) associated with specific Freight Consolidation Centre /

[4] NOVELOG project pilot involves about 50 freight vehicles

Urban Distribution Centre to use most appropriate (priority) bus lanes for their goods pickup/delivery service provision;

- allow the use of bus lanes by consolidation centre vehicles was considered a means to promote use of the consolidation centre;
- opinion of freight companies, logistic organisations, bus companies, cyclists' organisations and public authorities should be considered to define the viability of bus lanes usage;
- increase of the average speed of freight vehicles to access the city centre;
- consumption fuel reduction due to there is less congestion along priority bus lanes;
- CO2 and NOX emissions reduction due to less congestion along priority bus lanes;
- reduce journey times per freight transport and delivery trip;
- training for drivers who drive consolidation centre vehicles to aware them about the presence of the cyclists (i.e. freight vehicle drivers trained for economy/ecology driving, etc.);
- freight vehicles are fitted with blind spot lenses to see the cyclists.

Common *weaknesses* are presented for free access to public transport lanes/multi-user lanes.

- the width of existing bus lanes (generally 3.0m wide) might be a barrier to implement measure; it might be decided that only consolidation centre vehicles could use the bus lanes;
- some stakeholder opposition to the measure might be encountered, particularly from cycling organisations who believe that it is unsafe to mix HGV's with cyclists along bus lanes;
- the length of bus lane that can be used is small (3,2 km) when compared to the overall journey length from the consolidation centre to the city centre;
- the main benefits from using an inbound bus lane only occur during peak periods;
- there is only little benefit from this measure in off-peak periods;
- an increase of freight vehicles circulating in narrow bus lanes could be dangerous for cyclists;
- reduction of journey time savings due to more freight vehicles use the bus lanes.

Figure 17: Examples of free access to public transport lanes and multi-users lanes

Overall technical description

Multi-users lanes measure aims at managing access to reserved bus lanes including freight transport.

This is a pull measure, whereby freight vehicles are allowed free access to public transport priority / reserved lanes. In some cases, they must meet certain criteria set by the city administration to qualify for access, offering also an incentive towards cleaner or zero emissions vehicles.

This pull measure can be considered an added-value freight mobility services enabling of sharing dedicated bus lanes by logistics operators without affecting public transport system (maintaining acceptable level of service) and reducing congestion for all categories of users in the road network.

The usability of preferred lanes by specific recognised commercial vehicles (mostly by light commercial less polluting vehicles) needs to be monitored by dedicated ITS and recognition schemes.

The first step is characterized by the **identification of existing infrastructures** (**PT reserved lanes**) to be potentially shared between passengers and freight transport. The aim is to identify which lanes might be selected among existing road infrastructures for passengers and freight mobility sharing in terms of public spaces (transport corridors) usage. These lines should be selected among the ones (all lines or a subset of them) connecting urban and peri-urban areas with restricted areas (e.g. LEZ, LTZ, pedestrian areas, etc) useful for freight delivery services enabling to reach destinations for goods drop-off and pick-up in most convenient, safer, faster and cheaper way compared to the use of common road transport network (characterised by significant traffic patterns and congestion caused in some cases from conflicts between passengers and freight transport).

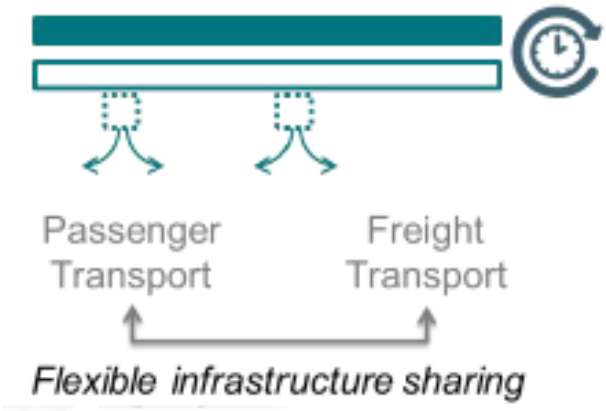


Figure 18: Sharing of public transport reserved lines (Source: NOVELOG project)

The process of identification and selection of most promising PT reserved lines to be shared with freight transport and last-mile delivery services in specific conditions (e.g.

time slots, dedicated passes, etc.) within an overall regulatory framework - aimed at promoting low-carbon mobility solutions, more energy efficient and performance-oriented last-mile services - should be set-up and implemented on the behalf of a specific agreement with the key actors in freight transport domain though so-called **Freight Quality Partnership (FQP)** signed amongst freight operators and PAs.

In this respect, the second step is characterized by the **local stakeholders' involvement** enabling to discuss and agree the overall regulatory framework covering the sharing of PT reserved lines based upon specific requirements for freight vehicles within a relevant recognition scheme.

Relevant stakeholders to be engaged for the participatory process (local stakeholders' meetings) should include: 1) Public Authorities (e.g. Local Chamber of Commerce, Municipalities, Region, etc.); 2) Logistics Operators (including freight couriers, professional logistics operators, etc.); 3) Retailers/other private:, 4) Associations (including association of logistics operators, commuters associations, cycling associations, public transport users' associations); 5) Technology providers (operation and management of the technologies to monitor freight traffics in LEZ/LTZ and bus lanes).

The third step is characterized by **local-based data collection** (such as though ad-hoc questionnaire, interviews, focus groups, etc.) about operational activities performed by logistics operators, covering relevant quantitative and qualitative data as follows: freight vehicles characteristics, average km per day, number of deliveries, vehicle utilisation factor, average vehicle speed from on board unit, number of entries in LEZ/LTZ and distances, main road transport corridors used, average km per day.

This data should be collected and analysed to get an overall picture of freight delivery services provided by logistics operators and main traffic patterns characterizing urban and FUA areas.

This will allow to get structured data to define the before (ex-ante) scenario as starting point for the further definition and establishment of relevant recognition scheme and potential FQP, which should include the definition of free of charge **freight vehicles permits/passes** (regulating access and use of flexible infrastructure sharing) to logistics operators allowed to use PT reserved lines. In this respect, it is strongly recommended to design and put in force a municipal ordinance (for the principle of subsidiarity) to regulate transit and parking of freight vehicles within the areas of intervention.

It is important to remind that to be eligible for permits/passes to use public transport reserved lines, logistics operators need to upgrade their vehicles to Euro 5 and using an on-board unit (OBU).

Therefore, the fourth step is the final definition of **freight transport recognition scheme** (by local stakeholders' involvement and concertation actions) and relevant freight vehicles permits/passes which will enable logistics operators of using PT reserved lines during specific time slots: in off-peak hours during the day, extended time windows during the day, times when buses are not using reserved lines based on data achieved by Automatic

Vehicle Monitoring (AVM) system as GPS-based vehicle location information in real-time showing those information on digital maps, etc.

The fifth step is characterized by possible use of existing ITS and ICT-based infrastructural systems (e.g. video cameras, OCR, etc.) used for **monitoring access gates of public transport reserved lines**, enabling to automatically verify if freight vehicles are authorised to use lines (having permits/passes).

Using, for example, Variable Message Sign System technology, lanes can be designated for different types of traffic and/or parking at various times of the day, including a "slot" for freight deliveries.

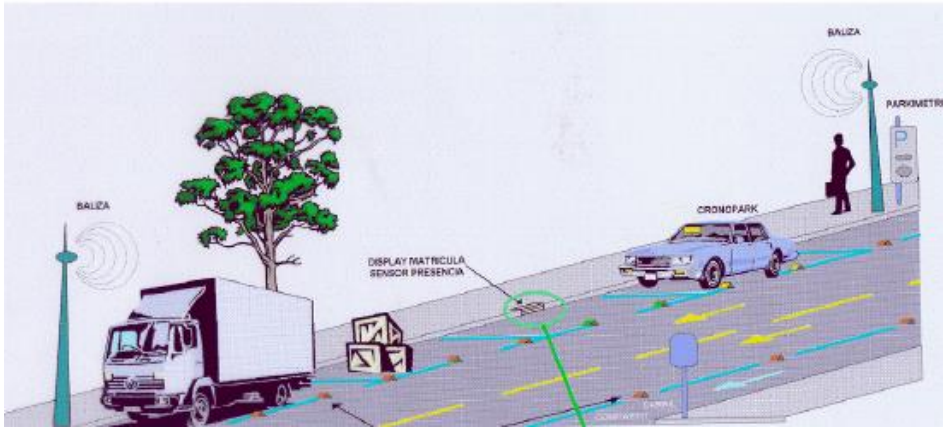


Figure 19: Sharing of public transport reserved lines (Source: Ajuntament de Barcelona)

One of the most important issue when defining and implementing multi-users lanes is to verify on-going and after (ex-post) piloting/experiments if the sharing of PT reserved lines between passengers and freight transport does not negatively affect level of service of public transport in terms of commercial speed along the reserved lines, frequency of the service, safety, etc.

It can be transferrable to any city/FUA, where priority/reserved lanes are in place and is expected to have impacts on the environment, economy and energy efficiency in freight transport and mobility.

3.6 Alternative delivery services for shoppers (B2C last-mile delivery by cargo bikes)

Introduction

Organizational measures are designed to set up and implementation of alternative freight distribution and eco-friendly systems (e.g. alternative freight delivery services) to ensure continuity of good deliveries and collection supply in LEZ/LTZ/pedestrian areas within target FUAs.

Last-mile logistics involves items being delivered from a depot and/or hub a short distance to their final destination. B2C last-mile delivery by cargo bikes is mostly home delivery-related service.

Collect points (Lockers), for example, is an alternative to home delivery, primarily for Internet shoppers. They can be located in convenience stores, the main benefit of the service being the reduction in failed deliveries and the subsequent return of goods by couriers and postal services. CIVITAS MIRACLE examined the feasibility of an alternative delivery system. The company Collectpoint plc offered an alternative to home delivery, primarily to Internet shoppers. Collectpoint plc (implemented in Winchester) expanded the service within the city up to five locations.

Furthermore, **Pack stations** is an innovative solution beneficial to both customers and for online stores with the aim to provide a convenient delivery alternative for internet shoppers and avoid failed home deliveries by the conventional delivery practices. In Szczecin (PL), for example, one relevant VA services was implemented namely Packstations 24/7. The goal was to provide businesses, offering on-line shopping, fast, convenient and affordable packages received by their customers and the customers complete satisfaction with their purchases. InPost is the largest independent postal operator in Poland, operating throughout the country (200 towns in Poland).

The service Packstations 24/7 was launched in June 2009 in response to growing customer's (individual and business) demand on modern postal services in the area of internet commerce.

This innovative service is a system of post office box, used to receive packages 24 hours a day, 7 days a week. A person doing the shopping via Internet - after ordering a package to the Packstation 24/7 – receives an SMS and e-mail with a code of reception. To receive the package from the box, one has to type their mobile phone number and receive the resulting code, and the expected delivery locker open. Within two business days after posting of the parcel, the package will be in the packstation. Customer is informed via SMS and e-mail on the address at which the package will be received.

The company La Petit Reine in Paris, for example, delivers purchases from big stores to consumer homes, using clean delivery vehicles, adapted to dense urban centres. Delivery vehicles are electrically-assisted cargo tricycles and electric vans. The cargo tricycles can go where small vans and other light freight vehicle cannot (e.g. city centres reserved for the pedestrians, etc.). La Petit Reine performed a new delivery service using exclusively “cargo cycles” or electrically powered tricycles, introduced 50 clean and silent vehicles in Paris, replacing diesel freight vehicles (vans). Over a twelve month period, it was estimated that La Petite Reine has helped to avoid 600,000 tonnes-km hauled by vans in Paris, to generate savings of 89 TOE (tonnes of oil equivalent) in engine consumption, to avoid emissions of 203 tonnes of CO2 and to reduce noise pollution.

La Petite Reine was founded on the basis that while 80% of its market concern parcels less than 30kg, a little van weighting more than a tonne is oversized regarding the real needs of the company.

An average load is no more than 100 kg for a complete route of seven hours and vans generate pollution, congestion and double parking. This is why cargocyles were favoured over regular vans.

The main innovation was the design of an innovative delivery vehicle, the so called Cargocycle®, an electrically assisted tricycle with a load capacity far higher than previous cycle freight vehicles on the market. In 2009, La Petite Reine was purchased by an association for the professional insertion of people (ARES). In 2011, Star's Service (French company leader in home delivery) purchased 51% of the company. La Petite Reine reoriented its activity, from parcels distribution to home delivery from large stores: it benefited from the Star's Service existing business. La Petit Reine offered deliveries up to 30 km, which may be more typical of a maximum for a delivery company.

Last but not least, the City of Graz is implementing an extension of an existing **e-bike B2C delivery service** within the NOVELOG project (Horizon 2020). The current delivery service "bring mE" has been evaluated in consideration of several indicators, such as amount of deliveries, average distance of delivery and reduction of CO2 emission, utilisation of capacity, delivered weight and volume.

The current delivery service "bring mE" is planned to be expanded: the existing e-cargo bike B2C service for goods bought in the city centre to be delivered to the customers' homes will be expanded into new areas (more shops in the adjoined streets, new housing areas). Main focus of the pilot is twofold: to lower the amount of traffic in the inner city; to spread awareness within shop owners regarding the effectiveness of the "bring mE" service as well as the importance of reducing the environmental impact of deliveries.

Preliminary self-assessment (readiness level)

- **Category of the measure:** Organizational (alternative delivery systems)
- **Policy design of the measure:** Initiated/supported by public administrations.
- **Involved stakeholders:** Shippers, Residents.
- **Possible barriers:** Possible concertation and cooperation obstacles: needs buy-in from a significant number of residents to make the scheme viable. Also, Internet retailers need to be willing to deliver goods to a location which does not match the address of the purchaser. Possible financial obstacles. Possible technical and timeline obstacles.
- **Innovativeness:** This is an innovative measure
- **Driver for success:** 1) Support and participation from the general public, delivery companies and online retailers, 2) Adequate budget to install receiving points.
- **Transferability:** Applicable to all municipalities/FUAs

Figure 20: Examples of new freight delivery places for alternative low-carbon B2C and B2B last-mile services

Overall technical description

Business to Consumer (B2C) sector is the core bussiness of alternative delivery services for shoppers.

The first activity to be undertaken for designing an effective and local-based green last-mile logistics service is represented by the definition of a knowledge framework on freight transport demand and supply characterizing the target FUAs (including LEZ/LTZ/pedestrian areas).

The overall objective is to collect and analyze relevant information and data in order to get a complete picture of the phenomenon of goods distribution in these areas (namely "baseline scenario"). Organizational measures should be designed to create alternative distribution and eco-friendly systems (e.g. alternative low-carbon delivery systems) to ensure continuity of good delivery and collection supply within areas (e.g. LEZ, LTZ, etc.) subject to restrictive and/or pricing measures.

It is necessary to clearly identify which sectors (supply chains) will be addressed by the cargo bike delivery service: commerce and trade, home and/or parking deliveries (e.g. meals on wheels, e-commerce home delivery, supermarket shoppers having option of their shopping being delivered by bike to their home and/or to specific storage areas such as transport interchanges, P&R, etc.).

Herewith, proposed **alternative delivery services for shoppers** (B2C last-mile delivery by cargo bikes) is all about delivering goods (shoppers' purchases in LEZ, LTZ, pedestrian areas, etc.) in specific public and/or private areas (e.g. passenger transport interchanges, etc.) where to get back done purchases.

An innovative service to potentially attract people in the historical city center to do shopping in a green and sustainable way might be defined within the overall framework of **last-mile cycle logistics**.

City users, coming from the hinterland (identified FUA), leave their cars in a passenger transport interchange and reach the city center with public transport. They do their shopping and leave the packets in the shops. Proposed low-carbon VA service collects and deliver the packets in a collection point in selected passenger transport interchange(s) - P&R - where the city users can recover their shopping bags. In this respect, based on literature review as well as results of expert interviews, cycle logistics has been identified to be a viable alternative to motorised vehicles to support environmental, economic as well as social goals, while zero-carbon measures mainly target environmental goals. The use of human-powered or electrically-assisted standard bicycles, cargo bikes and cargo tricycles for the transport of goods primarily in urban areas is well-known as a potential low-carbon freight delivery service to shorten final delivery distances.

The **geography of cities** within FUAs plays a major role for the viability of cargo cycles as an alternative to motorised vehicles. High density urban areas as well as narrow streets in historical city centres, naturally contribute to the attractiveness of this type of VA services. Positive impacts for city users of FUAs is expected to be achieved increasing the level of accessibility in restricted areas.

The daily distance bikes can travel is related to the terrain, weight they carry and the rider. The distance any company needs to travel in a day to make deliveries or provide services is difficult to estimate strongly depending from their business and local patterns. To facilitate the shift towards more sustainable city logistics, local authorities need to harness the potential of cycle logistics and provide conditions that incentivise private companies (including express couriers) to **integrate cycles into their supply chain for last-mile and express deliveries** by private or public–private partnerships.

This includes measures affecting material infrastructure (e.g. dropped kerbs, cycle lanes, etc.), nonmaterial infrastructure (incentivise the integration of sustainable last-mile in the supply chain across different companies), equipment (e-assist deregulation) as well as governance (e.g. LEZ, etc.).

Focusing on last-mile delivery for shoppers in selected interchange(s) by cargo bikes, recommended scheme is based on **micro-platforms** within the main city of FUA (being main shoppers attractor as well as having relevant restricted areas such as LEZ/LTZ/pedestrian), enabling to assure operational and financial sustainability of service, phasing out of conventionally-fuelled vehicles for last-mile.

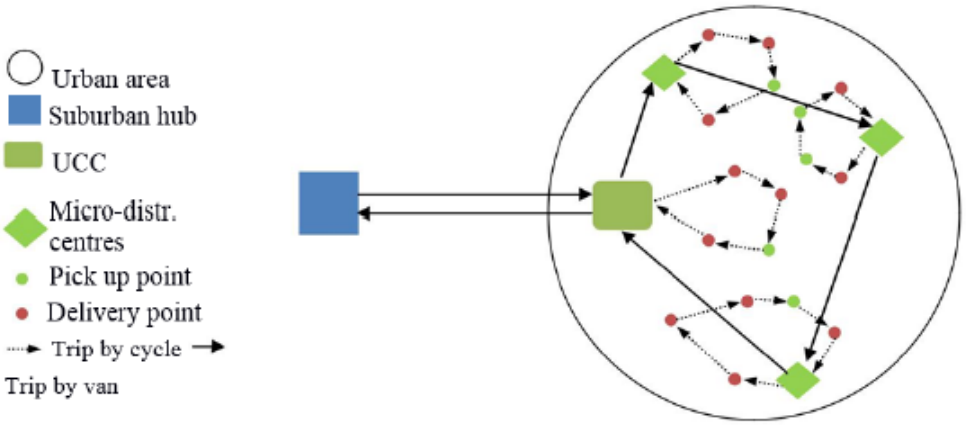


Figure 21: Example of cycle logistics scheme based on Urban Consolidation Center (UCC) and micro-distribution centres

It is important when designing this VA service that area covered for goods (purchases) pick-up and delivery is not too large. To support a **sustainable financial business cycle delivery** is best suited to dense urban areas where there are high concentrations of cycle based delivery activities.

Most cycle logistics operators are willing to share their experiences in starting up and providing advice on equipment as well as sustainable business models. A minimum level of IT solutions is required when starting up a cycle delivery business as this will assist in convincing customers of your professionality. Potential **set-up and running costs** involved in implementing a **cycle based delivery business** (B2B-B2C) are presented in Table 1, covering overall cost categories of last-mile service.

Cost Categories		Cost Description
Set-up costs	Company Set-up & Registration	Set-up of company and associated legal fees, VAT and tax legislation
	Cargo Bikes	Purchase of cargo bike and manufacture of box to carry cargo – need to consider purchase of 2 bikes as a minimum to provide cover in case of major mechanical problems
	Company Image and Design	Development of company name and logo along with supporting material (e.g.. business cards, promotional)
	IT & Communication Equipment	-General hardware (e.g. computer and printer) -Software (e.g. invoicing & accounting, tracking, etc.) -Communication facilities: -Land line -Mobile phones, Web & social media -Web-site, purchase domain name, hosting, social media
Running costs	Premises/Storage, Rental & Utilities	-Inner-city micro-platforms/hub for last-mile delivery -Business rates and/or property taxes
	Insurance	-Employers Liability -Public Liability -Cargo bike insurance -Goods in Transit (in case of loss or damage)

	Cargo Bike Maintenance	Set aside an amount for maintenance of the cargo bikes to cover regular servicing, replacement of parts, etc.
	Staff	Payroll costs for staff including payments, social security, pension contributions, etc.
	IT & Communications	-IT facilities (eg. hardware and software maintenance) -Communication costs (eg. landline rental, mobile phone contracts) -Web costs (eg. web hosting)
	Marketing & Promotion	Allowance required to cover items such as directory entries, business cards, etc. Excluding advertising
	Professional Services	Annual accounting and legal fees
	Funding/Cashflow	Funding will be required during the first few months of operation before a steady stream of regular income

Table 1: Set-up & Running Costs definition for B2B / B2C last-mile delivery by cargo bikes (Source: Cyclelogistics)

The business case framework of last-mile delivery by cargo bikes is provided in the **Annex III - Cycle logistics business planner** (Source: www.cyclelogistics.eu). The proposed business-oriented supporting tool has been developed within the Cyclelogistics project which was co-funded by the Intelligent Energy Europe (IEE) Programme of the European Europe. This business planning tool for cycle logistics companies is designed to help companies decide appropriate charges for the different services they offer. Based on the information user input, it also provides a monthly breakdown of activity, an annual summary and some useful performance indicators such as CO2 and fuel savings.

3.7 Green last-mile logistics services (B2B last-mile delivery by cargo bikes)

Introduction

Last-mile logistics involves items being delivered from a depot or hub a short distance to their final destination. Some larger delivery companies make the distinction between last miles (up to 10 miles/km from the depot) and last-metres delivery from the van in high density areas within.

In order to ensure continuity of goods procurement in urban areas subject to restrictive measures by those logistics and freight transport operators who do not intend to comply with the new regulations (LEZ/LTZ/pedestrian areas), alternative and eco-friendly delivery services should be put in place.

Cargo bikes are especially useful in towns and cities where some roads are closed to cars and vans. Many opportunities for using bikes for freight are emerging, in particular in busy, congested urban centres where parking is expensive and journey times by motorised transport are slow.

The most powerful argument for using bicycles for goods delivery for the majority of businesses is the lower cost compared with motorised transport. For people in their everyday lives, cost is also likely to be a significant factor especially if the cost of motoring rises.

The use of cargo bikes is a sustainable way for the delivery of small packages and groceries. They are especially effective in compact, congested towns and cities, where a

cargo bike rider, unworried by parking tickets and able to use bike-only routes, can often deliver more packages in a day than their van-driving equivalent, even with the smaller payload requiring occasional returns to the depot.

Since 2010, in the city of Donostia approximately 48.000 packages per year are delivered with cargo bikes, which implies reduced emissions and less energy consumption. From the public bodies it is important to incentive this kind of initiatives, as Donostia city council is removing access restrictions for cargo bikes. The access to pedestrian zone is permitted at any time and cargo bikes are allowed to park, load and unload on the sidewalk. City of Graz is planning the introduction of an **eco-B2B delivery service** within NOVELOG project. In NOVELOG Graz pilot, B2B service will be introduced focusing on the organisational upgrade of cargo receipt to a central node, from where goods will be distributed to shops by E-cargo-bikes or E-vans, reaching lower traffic in the inner city.

Figure 22: Examples of cargo bikes (Source: CycleLogistics Final Public Report)

The city of Berlin presented the "**BentoBox**", Europe's first prototype of a flexible collection station for packages, little packets and smaller sachets. The station was combined with the deployment of innovative cargo bikes to achieve quick, cost efficient, emission free and almost silent distribution of goods. The "BentoBox" has been set up in cooperation of politics, administration and corporations to find innovative solutions for business transactions in Berlin.

Setting up an additional city hub to coordinate distribution allowed supplying a number of densely populated neighborhoods using cargo bikes, including some electric ones. Due to its variously sized shelves the "BentoBox" allows collecting all kinds of mailings, ranging from moving boxes to single letters. Certain parts of the box are accessible to end customers who can pick up their mail directly, others are designed for CEP services incl. couriers, express and parcel services.

Applying GPRS connection allows integrating the "BentoBox" directly in enterprise disposition processes. This technology will in future allow to inform recipients about the status of their mailing. The "BentoBox" had been integrated in the regular logistics services by Messenger Transport + Logistik GmbH in Berlin. Since we apply the BentoBox as a collection and distribution centre, delivery by car finishes at the BentoBox. Remaining

distance from the box and to the box is covered by cargo bike. The BentoBox was installed within CityLog project.

One possible innovative way to do express pick-ups and deliveries in cities is to use a **Mobile Depot** which is a trailer fitted with a loading dock, warehousing facilities and an office. In the morning, the trailer is loaded with all inner-city deliveries for that day and is then driven to a central parking location in the city. From there, the final deliveries are carried out by dispatch riders **on electrically supported cyclocargos**. The Mobile Depot concept was tested by TNT Express in Brussels within the framework of the European FP7 project STRAIGHTSOL. Depending on the type of urban area where it is used, efficiency and time gains are possible which, in combination with the kilometre reduction, can be expected to reduce the eventual cost per stop paid by the express delivery service provider.

Figure 23: The Mobile Depot integrated with cargo bikes for last-mile delivery (TNT express and parcel pilot service)

Preliminary self-assessment (readiness level)

- **Category of the measure:** Organizational (alternative delivery systems)
- **Policy design of the measure:** Initiated/supported by private sector.
- **Involved stakeholders:** Shippers, Residents.
- **Possible barriers:** Possible concertation and cooperation obstacles: needs buy-in from a significant number of shoppers to make the scheme viable. Also, Internet shoppers need to be willing to get back goods to a location quite different from address of the purchaser.
- **Innovativeness:** Innovative measure
- **Driver for success:** 1) Support and participation from the general public, delivery companies and online retailers, 2) Adequate budget to install receiving points.
- **Transferability:** Applicable to all municipalities.

Common *strengths* are herewith presented for cycle logistics initiatives.

- adequate vehicles in inner city areas (pedestrian zones, historic centres, etc);
- less usage of space;
- less congestion and less freight vehicles in city centre, which implies a reduction of fuel consumption, emissions and noise level (less noise and pollution);
- reduction of energy use in urban freight transport by promoting the use of bicycles instead of motorised vehicles;
- motivate urban delivery service companies to integrate cargo bikes into their fleets;
- promote cargo cycling in the policies, creating favourable framework conditions such as the creation of new spaces in the city for parking cargo bikes.

Common *weaknesses* are herewith presented for cycle logistics initiatives.

- not all the goods can be transported by cargo cycles (appropriate for weight up to 400kg);
- the size of cargo bikes should be limited to avoid accidents with motorized vehicles;
- political changes may delete the regulation incentives to access the city centre for cargo-bikes, reducing their effectiveness.

Overall technical description

Business to Business (B2B) sector is the core bussiness of green last-mile logistics services by bikes.

The first activity to be undertaken for designing an effective and local-based green last-mile logistics service is represented by the definition of a knowledge framework on freight transport demand and supply characterizing the target FUAs (including LEZ/LTZ/pedestrian areas).

The overall objective is to collect and analyze relevant information and data in order to get a complete picture of the phenomenon of goods distribution in these areas (namely the “baseline scenario“). The purpose of the interventions related to urban logistics must ensure the delivery of goods to commercial activities of the area subject to restrictive measures (e.g. LEZ, LTZ, etc.), while allowing free competition without imposing a monopoly system to benefit some private companies.

If the purpose a reduction of indirect costs on society (such as environmental impacts related to traffic flow and the saturation of the area) it must be considered that the distribution by third parties (professional operators) is a large part of urban freight transport market in terms of goods volumes, but at the same time, it is the portion that has less impact on accesses and traffic flows compared to own-account and self-procurement distribution of goods.

The importance of undertaking targeted interventions and appropriate VA services is immediately clear, with the aim of moving portion of the freight traffic flows generated by

own account operators, to professional operators or alternatively transferring them onto a **green last-mile logistics service** (including the use of cargo bikes) that can be promoted by Public Authority (PA).

Therefore organizational measures should be designed to create alternative distribution and eco-friendly systems (e.g. alternative low-carbon delivery systems) to ensure continuity of good delivery and collection supply within areas (e.g. LEZ, LTZ, etc.) subject to restrictive and/or pricing measures.

It is recommended to establish clear, lasting and locally shared rules to access the city/FUA for people and goods in a non-coercive way, but rather through the concept of recognition scheme open to all, according to rules that provide optimized loads, eco-friendly freight vehicles (including cargo bikes), tracking of vehicles/goods, safety and security, respect of contractual conditions envisaged by respective sector's contracts. This type of approach arises in particular by the need to have a greater impact in terms of reduction of fragmented freight transport (own account) that appears to be characterized by low vehicle's loading coefficients, by hardly significant volume of handled goods compared to the number of circulating vehicles and by excessive use of the public spaces (e.g. roads, loading/unloading areas) causing system inefficiencies for urban mobility.

Despite of well-known good practices of consolidating goods deliveries in hubs (e.g. UCC, UDC, etc.) within the peripheries of a city (urban freight hubs), the consolidation of deliveries in distribution **micro-platforms within the inner city** demonstrates to be an equally successful last-mile delivery.

Focusing on **last-mile delivery by cargo bikes**, recommended scheme is based on micro-platforms within the main city of target FUA enabling to assure operational and financial sustainability of VA service provided by a such low-carbon mobility mode phasing out of conventionally-fuelled vehicles.

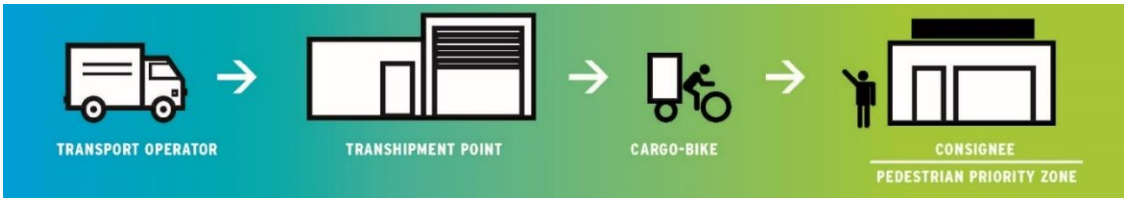


Figure 24: Operational scheme of the concept of micro-distribution of freight (source: NOVELOG project)

Nevertheless, the criteria necessary to justify such a logistics platform in inner city is as follows:

- freight distributors must have a sufficient volume of deliveries to the city centre,
- sufficient density of customers must exist within a selected area to justify the deployment of walking or cycling couriers (last-mile delivery by cargo bikes),
- convenient customer and vehicle access to the platform must be provided,
- availability of secure premises for the platform.

The key task is to identify and select the managing company that can fully meet the needs of corporate model, provided infrastructure, accessibility, innovation, skills and know-how required to manage the distribution of goods within last-mile in an efficient and economically sustainable way.

The identification of the managing company represents one of success indicators, as it will be able to ensure proper start-up and operational development of the **alternative green last-mile logistics service**, respecting needs of all stakeholders involved in the urban distribution phenomenon, with the fundamental peculiarities of impartiality, functionality, quality of service as well as achievement of predetermined targets. The complexity of the urban distribution process can only be tackled by a manager strongly oriented to entrepreneurship. In case PA might be directed towards the creation of a partnership (e.g. public-private or fully private) the presence of a private entity operating in the logistics market is fundamental, because it is essential to have a figure with adequate operational capacity, able to provide access to significant volumes of goods for the activation and continuation of the distribution services and having the aim to achieve a balanced budget and economic returns.

A fundamental requirement of the alternative freight distribution service is to ensure neutrality and confidentiality with respect to those involved, so as not to cause disruption in the shipping market as well as to be able achieving economic self-sustainability of the distribution service. The latter is of fundamental importance: where urban logistics projects and initiatives have been developed, if the achievement of self-sustainability of the business model was not declared among the primary objectives, the initiative or model saw its natural conclusion as soon as public subsidies were over.

To achieve an optimal organizational structure, the managing company shall:

- use in a comprehensive and coordinated way resources and skills of operational, commercial and support staff nature,
- adopt such an organizational model as to achieve quality certification,
- enable additional services to move and distribution of goods (e.g. reverse logistics),
- ensure compliance with the terms and conditions provided for by sector contracts,
- ensure flexibility in the use of human and technical resources,
- only outsource non-core assets (non-core business).

It is necessary to clearly identify which sectors will be addressed by the cargo bike delivery service:

a) Commerce, trade and industry,
b) Service sector (catering services, electricians, maintenance, street vendors, advertising, etc),
c) Home deliveries (e.g. meals on wheels, e-commerce home delivery, supermarket shoppers having option of their shopping being delivered to their home by bike, etc.).

To design a local-based B2B last-mile delivery by cargo bikes for FUAs, it is recommended to set up a **preliminary assessment of potential service's characteristics** from both supply and demand side.

The key aspects to be dealing with are as follows:

- size of commercial and business activities which are placed in the selected "restricted" area,
- products and volumes/weights of goods taken (self-procurement) or received (third parties),
- frequencies of goods taken (self-procurement) or received (third parties),
- type and number of vehicles used for self-procurement or receiving goods by third parties,
- number of kilometres per trip and number of trips per day for self-procurement,
- number of kilometres per trip and of trips per day for receiving goods by third parties,
- weight or volume of an average load for self-procurement or receiving goods by third parties.

The **legal frame conditions** regarding cargo cycle use is also an important issue to be considered when planning to design and implement B2B last-mile delivery by cargo bikes. The legal frame conditions vary across Europe. There is for instance no legal limit on the size or weight of a pedal cycle in Britain: goods tricycles need simply brakes on all their wheels and electrically assisted pedal cycles are not allowed to weigh more than 40kg if a bicycle or 60kg if a tricycle (unladen weight).

At present, in many cities deliveries are done in small freight vehicles (vans) and some of these deliveries could potentially be transferred to cycles. Using cargo bikes for last mile freight deliveries is particularly attractive offering greater efficiency and flexibility than motorised transport, saving time and costs as well as contributing to reduce CO2 and pollution for creating liveable cities.

Furthermore, in terms of capability of matching supply and demand cargo bikes' goods delivery demand is possible to transport loads up to 60 kg with a two-wheeled load-carrying bike. Other types of cargo bikes exist and are being designed for specific purposes. This improvement in speed and load carrying may help organisations switch to use of bikes. Delivery companies are also adding cargo-carrying bikes with small electric motors to assist with heavier loads and hills. Electrically-assisted cargo bikes seem to offer 20-40 km per charge of their battery. The distance any company needs to travel in a day to make deliveries or provide services can be difficult to estimate. A figure of 8km per return trip without electrical assistance and 20km with electrical assistance as reasonable for most businesses, with a load of not more than 200kg in weight and 1.5-2 cubic meters in volume.

Another important issue when designing and implementing this type of service is to guarantee **a minimum level of ICT-based solutions** which will assist in convincing customers of operator's professionality. A freight delivery company should be able to prove a delivery is made so a minimum requirement is for a proof of delivery solution. Furthermore, in case of cycle logistics operator works with a number of traditional logistics companies then they may need to be using several different Proof of Delivery (POD) devices. An integrated system which would allow only a single POD device to be used would be an ideal situation. To make a cycle delivery service profitable it may be necessary to consider offering other related logistics services (e.g. stock management, order picking, etc.).

Safety of cargo bikers is an important issue especially with regard to traffic conditions. This varies hugely between countries and between towns within countries. The approach to safety also varies, including legal conditions that favour bikes over motorised vehicles (including paths and other infrastructure, rights-of-way, advanced signalling, access by bikes/restriction to automobiles, and responsibility in collisions) and training for cyclists and drivers of large vehicles.

The priorities for provision of B2B last-mile delivery service by cargo bikes are summarized as follows:

- Cost of staff,
- Capital cost of equipment (vans versus cargo bikes),
- Potential fuel savings,
- Fixed costs savings (e.g. tax, insurance, congestion charges, etc.),
- Efficiency and appealing of service (e.g. quicker, more reliable, green credentials),
- Carbon savings (CO2 emission cutting),
- Imposing restrictions on motorised transport (conventionally-fuelled vehicles),
- Lifting restrictions on cycle access (e.g. one-way street contraflows, no license requirement)

The business case framework of last-mile delivery by cargo bikes is provided in the **Annex III - Cycle logistics business planner** (Source: www.cyclelogistics.eu). The proposed business-oriented supporting tool has been developed within the Cyclelogistics project which was co-funded by the Intelligent Energy Europe (IEE) Programme of the European Europe. This a business planning tool for Cycle Logistics companies is designed to help companies decide appropriate charges for the different services they offer. Based on the information user input, it also provides a monthly breakdown of activity, an annual summary, and some useful performance indicators such as CO2 and fuel savings.

The proposed delivery service requires a phase of experimentation and successive fine-tuning, necessary to ensure technical, economic and environmental reliability (including economic self-sustainability) of the service to allow its stabilization and consolidation once it is fully operational.

Finally the **advantages and disadvantages of using cargo bikes for last-mile deliveries** have been effectively identified and reported by Transport for London (TfL): Cycle Freight in London – a Scoping Study, a report commissioned by Transport for London and published in May 2009[5]. Many of the identified advantages and disadvantages can be applied to the majority of cities in European FUAs.

Advantages	Disadvantages
• Purchase Cost: cycles are cheaper than vans, but for either mode this cost is small compared with the running and staff costs and the turnover associated with the vehicle. • Running Cost: Tax, insurance, storage and depreciation are all lower for cycles than for vans which can result in a significant cost saving. Fleet managers recognise the potential but don't see this saving as a reason to switch to cycles – instead it is seen as a benefit of doing so. For dedicated operators of cycle freight businesses, these savings keep their pricing competitive. • Speed in Congestion: Cycle journey times are more reliable as they are less affected by variable traffic conditions.	• Security: security is a big concern, however, evidence emerging from the interviews with companies using cycles suggest that fears may be exaggerated as there were almost no instances of either cycle or payload theft. • Limited range and payload: Range is mainly an issue where the company's logistics model has led them to have their distribution hubs at the edge of or outside the city. However, with a secondary city-centre hub or using vans themselves as mobile hubs, large niches can be created for cycles. Payload can be an issue, however, the lack of awareness of the technology available and of the current payload capability of cycles is more of a problem. • Driver fatigue: For smaller

[5] http://www.tfl.gov.uk/assets/downloads/businessandpartners/cycle-as-freight-may-2009.pdf

• Parking Cost and Congestion Charge: cycles can be parked (almost) anywhere without incurring any charges and are not liable for the congestion charge. In practice, however, the congestion charge seems to benefit vans as much as cycles as the benefit of reduced traffic outweigh the one off daily charge. • Low Environmental Impact: Customers already using dedicated cycle freight companies mostly cited speed/cost/reliability as more important than 'green' benefits of cycles.	operations, this is a significant issue where existing staff would not want or would not be able to switch to using a bike. For larger companies, staff turnover means that they could switch to recruiting individuals able and willing to do the job by cycle. • Seasonality: This may be perceived as a problem especially when employing staff using very flexible contracts. However, if riders are employed directly or paid by mileage rather than 'drops', this perceived problem may be overcome.

Table 2: Summary of advantages and disadvantages of using cargo bikes for last-mile deliveries (Source: Transport for London)

4 Towards Value-Added services application in the pilots

Herewith, **baseline scenario for the SOLEZ target FUAs** which are planning to design and piloting low-carbon Value-Added mobility services is briefly summarize in order to consolidate and demonstrate as the potential pull services identified by the relevant project's partners through a structured consultation process implemented in the SOLEZ target FUAs (Action Plans) are well-fitting and addressing defined strategic objectives and goals towards low-carbon mobility paradigm in FUAs.

Vicenza FUA

The Low Emission Zone (LEZ) in Vicenza FUA is represented by the most densely urbanized area of the city of Vicenza (14 km2). In this area, there is a winter driving restriction/access regulation. In Vicenza there is also a Limited Traffic Zone LTZ (0.38 km2) which is in the historical centre.

On the other hand, passenger transport interchanges are accessible by three Park & Ride stations in which is possible to leave private car and take public transport to reach the

central area of the city. P&R stations are mostly used by working commuters, which need to reach the historical center of Vicenza. Furthermore, these stations are also used by not systematic travellers, which need to reach the historical center for shopping, leisure, etc. Regarding freight transport in urban areas, a last-mile delivery service is active in Vicenza since 2007 based upon an Urban Distribution Center (UDC) and the relative goods delivery service namely "VELOCE" (Vicenza Eco-LOgisticCEnter). VELOCE is managed by Vicenza Logistic Center s.r.l, a participated company of Vicenza Municipality and other local business associations: ASCOM, API, Confindustria, CNA as well as Confartigianato.

In this respect, Vicenza is planning to design and implement an innovative **freight transport** service based on parking delivery of goods for LTZ shoppers, including residents, city users as well as tourists.

Graz FUA

The City of Graz has no Low Emission Zone (LEZ) after the Austrian LEZ framework, however the Styria-based LEZ operates in Graz as well. Operator active in PT service provision is Graz Holding (a 100% daughter of the City of Graz). Third party is the Styrian Association of public transport.

On the other hand, different public transport journey planning (via web, mobile apps, etc.) are active.

Graz has several e-car sharing offers, of which tim (täglich-intelligent-mobil) is operated by Holding Graz. Currently, 4 tim-stations are in operation, and situated as intermodal mobility-hubs offering an interface for different means of transport. It is planned that 5th should be opened in spring 2018, respectively, an EFRE-funded project is currently assessing the opportunities to establish tim also in the peri-urban area of Graz.

Regarding bike sharing, a new bike rental system was launched in Graz (August 2012), respectively, it is planned that a free-floating bike sharing scheme will be launched in the coming months, operated by O-Bike. Graz Bike enables tourists and residents alike to use a variety of bicycles for many purposes. Graz Bike is a rental system built upon an already existing pool of bikes for hire from which customers can select the right bicycle for their purpose. It supplements this pool with new and different types of bicycles, all in a unified design. Users can choose from city bikes, e-bikes, trekking bikes, kids' bikes and cargo bikes. Regarding carpooling, there is no public carpooling service available. Regarding Park and Ride facilities, the City of Graz offers currently 9 Park and Ride facilities with a capacity for 1.945 cars. There is also the offer for combined mobility with the "Kombi-Ticket", for the user of the P+R with a reduced fare for the public transport.

The City of Graz implemented - within the SMARTSET project - an innovative urban logistics service: the cargo-bike service 'Bring mE'. 'Bring mE' will continue on a larger scale, reaching more customers and extending its service portfolio, within the NOVELOG (New Cooperative Business Models and Guidance for Sustainable City Logistics) project. Moreover, Graz is interested in implementing a b2b-last mile delivery service and an urban logistic hub close to the city centre.

Based on consultation process with the local stakeholders, Graz is planning to promote soft mobility modes (mostly walking) by integrating into tim (a multi modal transport and

mobility hub that offers, inter alia, car-sharing, for example, by including the digital maps for a green network.

Value-Added Service developed within SOLEZ could be the missing link to connect **passenger transport** offers that are already available.

Turin FUA

The LTZ is an area licensed based. There are several kinds of premise but the mains are two: Blu premise A (entrance in "ZTL Centrale") and Blu premise B (entrance in "ZTL Centrale" and ZTL Trasporto pubblico). The Central ZTL area is closed to traffic from Monday to Friday from 7.30am to 10.30am, including some pedestrian streets and others reserved to PT for the entire day.

On the other hand, PT service provider is Gruppo Torinese Trasporti – GTT which also manages several parking houses and street metered parking (via web, mobile apps, variable message signs, etc.). GTT manages several parking stations near city boundaries and passenger interchanges.

Real-time passenger information (at bus stops, via mobile apps, etc.) is managed in Turin by the public company "5T" (owned by City of Turin, Piedmont Region, Metropolitan City of Turin and GTT). "5T" also manages real-time transport and traffic information and PT journey planning. The city of Turin has different car sharing services in operation: two car sharing services are free float mode (Car2go and Enjoy) with 800 vehicles; one car sharing service is one-way mode (Blutorino) with 400 electric vehicles and 700 charging stations. Turin has a bike sharing service, which is managed by the ToBIKE company (private). There are 120 bike stations and about 1000 bikes.

In April 2017, a new taxi carpooling service (WeTaxi) started; it involves the taxi companies and a start-up from the Politecnico of Turin. Regarding freight transport, the car sharing service "IoGuido" allows a van sharing service since 2010. A "Freight quality partnership" was signed among City of Turin, professional and retail transport associations. It consists of pull measures and the operators involved in the test have a special pass that allows them to enter with no time limitations in the LTZ and to use the public transport reserved lines. The FQP was signed by: City of Turin, Chamber of Commerce of Turin, C.N.A. Torino, Fita-Cna, API, Confindustria Piemonte, Fedit, AICAI, Aspaci, Ascom-Concommercio Torino, Confesercenti, Confartigianato, Confartigianato Trasporti, Confcooperative Torino, F.A.I. Torino, Unione Industriale.

In this respect, Turin is planning to design and implement two different low-carbon Value-Added mobility services: a Mobility as a Services scheme (**passenger transport**) and multi-users lanes (**freight transport**) though an enlargement (operators involved, PT lines shared, etc.) of NOVELOG.

Sárvár FUA

Sárvár is the smallest FUA within the SOLEZ project, with 15 thousand inhabitants. Besides Sárvár, one smaller city and 40 villages belong to Sárvár FUA. The total population of Sárvár FUA is nearly 39 thousand people. Sárvár is one of the most visited Hungarian spa city with yearly half million guest nights and 700,000 spa visitors.

There is no LEZ/ZTL operated in Sárvár and Sárvár FUA. In Sárvár there are some traffic limitations and environmentally-friendly sustainable transport modes that have already been implemented.

The construction of bicycle and pedestrian routes plays important roles in Sárvár's conception. In the neighbourhood of the spa, a bike route has already been built. In the Health Resort Area, the speed limit is 30 km/h and 12 t heavy vehicles are not allowed to go in. These heavy vehicles – except direct freight – are restricted from the main road going via the city center. Further bicycle and pedestrian routes are planned to be built in the city. As far as carpooling is concerned, there is not an organized way of it, however a lot of employees from Sárvár's FUA use this sustainable transport mode to reach the industrial park in Sárvár. In Sárvár and in its FUA, there are numerous opportunities of carsharing because people can rent cars in several places, which may also be a sustainable transport mode.

Regarding park and ride facilities, there are no such places in Sárvár. In this respect, Sárvár is planning to design and implement an ICT tool to encourage people (especially elderly) and tourists to use low-carbon mobility transport already available as they move between Sarvar SPA area and the city center. Another idea is to promote low-carbon mobility to link the train station (North) with the SPA area (South). Sárvár is planning to develop the MaaS concept to aggregate the different transport solutions by one app, enabling to provide multimodal **passenger mobility** solutions.

Gdansk FUA

There are six ways to enter the ZTL in Gdansk. Gdański Zarząd Dróg i Zieleni (Gdansk Road Authority) provides passenger information at bus stops, traffic information via variable message signs (VMS) and via webpage as a part of ITS (ITS "Tristar" introduced in Gdansk, Gdynia and Sopot). Zarząd Transportu Miejskiego w Gdańsku (City Transportation Office in Gdansk) provides passenger information at bus stops, via web and mobile app. PT journey planning is provided by tristar.gdansk.pl which is a web-based planner as a part of ITS ("Tristar"). Furthermore, Jakdojade.pl is a nongovernmental web-based and mobile app PT planner. Car sharing is not active while bike sharing is in development. Regarding carpooling, web-based services as BlaBlaCar is in operation.

In this respect, Gdansk is planning to design and implement a **freight transport** Value-Added service based on a B2B last-mile delivery by cargo bikes for the pedestrian areas of the city and beyond. The business model for freight delivery in Gdansk is made by many small private companies. Pull measure could be also to give them the possibility to enter the pedestrian areas by using cargo bikes as well.

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6. Annexes

Annex I - SocialCar self-assessment tool (Source: socialcar-project.eu)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 636427.

www.socialcar-project.eu

SocialCar Implementation Roadmap Tool

This tool establishes the implementation environment for the SocialCar app at any site and identifies the Business Case scenario which is most applicable.

Reset all checkboxes before starting → *Click here*

Enter the name of your site:

*** ALL QUESTIONS MUST BE ANSWERED**

Driving conditions

		Throughout most days	At peak times on most days	At some times on some days	Not really
1	Does the city centre experience regular congestion?	○	○	○	○
2	Do the main routes / corridors into the centre experience regular congestion?	○	○	○	○
3	How often do other areas of the city experience bad congestion?	○	○	○	○

		All day	During daytime working hours	Peak periods only	None
4	Are there access restrictions for private vehicles in city centre?	○	○	○	○

		High	Medium	Low	None
5	Typically, what is the difficulty of finding a parking space in the city centre?	○	○	○	○
6	What best describes the parking charges in the city centre?	○	○	○	○
7	Typically, what is the difficulty parking in the other areas of the city?	○	○	○	○
8	What best describes the parking charges in the other areas of the city?	○	○	○	○

Public Transport service provision

		Excellent	Good	Fair	Poor
9	In general, how would you describe public transport (PT) services in the city?	○	○	○	○
10	In general, how would you describe PT services in the areas surrounding the city?	○	○	○	○

		All main routes	Several main routes	A few main routes	None
11	Are there high frequency segregated* services on the main corridors into the city?	○	○	○	○

* Segregated services are PT services which do not share the road with private cars; e.g. Trains, Metro, Trams, Express buses with dedicated bus lanes

		High	Moderate	Low
12	What best describes Public Transport fares in the city and surrounding areas?	○	○	○

		Single provider for whole region	A few providers for whole region with good coordination	A few providers for whole region with little coordination	Large number of providers with little coordination
13	How are PT services provided in the city and and surrounding areas?	○	○	○	○

Carpool status in your city/region

		Yes and it is well used with good geographic coverage	Yes but it is difficult to find matching rides	Yes but there is limited interest from the public	No
14	Regional/citywide public carpool service is provided by the city transport authority	○	○	○	○
15	A Regional/citywide carpool service is provided by a commercial operator	○	○	○	○

		It is very common	At several sites	At a few sites only	N/A
16	Presence of dedicated (closed) carpool schemes to employment sites	○	○	○	○

		Established (>5 years)	Maturing (2-5 years)	Young (< 2 years)	N/A
17	Overall, what best describes the carpooling schemes in operation	○	○	○	○

		tick if yes
18	Carpooling has been tried in the past but no carpool schemes currently operate	☐

		Yes and it is well used with good geographic coverage	Yes but there is limited supply / geogrpahic coverage	No
19	Do on-demand car services such as Uber or instant (real-time) carpooling services exist?	○	○	○

Data availability

			Open data readily available for developer use	Available on request in format suitable for developer use	Available on request but format unknown	Available from commercial providers but at a cost	Not available
20	Access to accurate static PT data (e.g. stop + schedule data)	Network wide	○	○	○	○	○
21	Access to real time PT data	Network wide	○	○	○	○	○
		Certain routes only	○	○	○	○	
22	Access to planned road network disruptions; e.g. roadworks, closures data etc.	Network wide	○	○	○	○	○
		Certain routes only	○	○	○	○	
23	Access to real time traffic/congestion data	Network wide	○	○	○	○	○
		Certain routes only	○	○	○	○	
24	Access to real time parking data	Network wide	○	○	○	○	○
		Certain areas only	○	○	○	○	
25	Access to existing carpool trip offer data	Network wide	○	○	○	○	○
		Certain providers only	○	○	○	○	

			Open mapping data readily available for developer use	Mapping data available from commercial providers but at a cost	Open mapping data exists but is incomplete or poor quality	Not available
26	Access to mapping data which App developers can utilise	Network wide	○	○	○	○

Communications

		Excellent	Good	Fair	Poor
27	Reliability of mobile network coverage across your Region	○	○	○	○

		Majority of PT services	Most segregated PT services	A few segregated PT services	Very limited
28	Availability of free WIFI on PT services	○	○	○	○

* Segregated services are PT services which do not share the road with private cars; e.g. Trains, Metro, Trams, Express buses with dedicated bus lanes

		Across whole region	In city areas only	In city centre only	None
29	Availability of free WIFI in Region	○	○	○	○

		Well used twitter or facebook accounts with real time updates on network conditions / service status	Twitter or facebook accounts for sharing static news and information	None
30	Use of SocialMedia by authorities & PT operators to communicate with travellers	○	○	○

Pre-booking, integrated ticket and payment functions

		There is a standard ticket price for all PT journeys in the region	There is a standard ticket price for all PT journeys in the region excluding trains	There is a different standard ticket price for different PT modes excluding trains	Fare data is complex and difficult to obtain
31	Structure of PT fares applied	○	○	○	○

		Fare finder API exists for all PT services in Region	Fare finder API exists for certain services only (e.g. train)	No fare finder API exists for any PT services
32	Is PT journey fare data available	○	○	○

		A single PT ticket is available for all modes and operators in the region including trains	A single PT ticket is available for all modes and operators in the region excluding trains	A single PT ticket can be used on all modes as long as they are provided by the same operator	There is no integration of tickets between PT services
33	What best describes the level of ticket integration between PT services	○	○	○	○

		Yes for all PT services and developer API available to embed this within SocialCar	For some PT services only, and developer API exists to embed this within SocialCar	Yes, but transaction must take place seperately on third party (e.g. PT provider) app	Not available
34	Are single journey* e-tickets / m-tickets available to book & purchase via an app? * or day ticket	○	○	○	○

		Yes and developer API available to embed this within SocialCar	Yes, but transaction must take place seperately on carpool provider app	Not available
35	Can carpool trips be booked and paid for via an app?	○	○	○

Journey Planning (JP) and Travel Information Tools

		Yes, its well used by the public	Yes, but it is not very well used	No
36	Does the municipality / transport authority offer a well established journey planning app?	○	○	○

		Yes, its well used by the public	Yes, but it is not very well used	No
37	Does the main PT operator offer a well established journey planning app?	○	○	○

		Yes, its well used by the public	Yes, but it is not very well used	No
38	Is there a well established independent travel info / journey planning app specific to your Region?	○	○	○

Annex II – MaaS Readiness Level Indicators (Source: CIVITAS ECCENTRIC)

STRATEGIC READINESS	
Strategic focus	
1.The local authority has no measure taken to explicitly support MaaS development in the city	○
2.The local authority is involved in measures to support the development of mobility services together with the service-providers and/or incentives are used for creating Maas	○
3.The local authority has a plan/strategy/policies to explicitly support the development of MaaS in the local context	○
4.The local authority has local funding to support the change (project or continuous funding)	○
5.The local authority has a named person to be in charge of MaaS development. The local authority develops MaaS systematically	○
Parking policy	
1.The local authority does not have a parking policy	○
2.The local authority has a parking policy, but it does not explicitly support the shared use of vehicles and/or transport on demand	○
3.Politicians are ready to change parking policy on critical areas in the local authority or they are ready to take measures to reduce private motoring/ car ownership	○
4.The local authority is active in supporting new business models by adapting parking standards for (new) residential developments	○
5.The parking policy supports shared cars by offering priorities/cheaper parking/parking zones for shared vehicles and parking permits are easy to acquire	○
INTERNAL USE	
Travelling guidelines for the staff and politicians	
1.Internal travelling guidelines for staff and politicians of the local authority do not prioritize sustainable mobility	○
2.Internal travelling guidelines prioritize sustainable mobility, but are not monitored by the local authority	○
3.Internal travelling guidelines prioritize sustainable mobility and travel patterns are monitored and reported annually by the local authority	○
4.Internal travel instructions prioritize the sustainable mobility, travel patterns are monitored annually by the local authority and there is a clear plan to reduce the use of private cars on work travel and to promote the use of shared mobility	○
5.Internal travelling instructions prioritize sustainable mobility, travel patterns are monitored annually, use of private cars on work travel has declined during the past 3 years	○
Use of shared mobility within the local administration	
1.The local authority is not using shared mobility services itself	○
2.The local authority offers shared cars/bikes etc for the use of its staff and politicians, but it is limited to a small number of employees	○
3.The local authority offers shared cars or bikes for the use of the majority of staff and politicians	○
4.The local authority uses shared mobility services offered by several service providers	○
5.The local authority uses shared mobility services offered by several service providers, not limited to working hours only	○
SHARED USE	
Shared economy – availability and market penetration of shared and combined travel options	
1.There are no companies offering shared vehicles in the local authority	○
2.There are pilots/campaigns/incentives taking place in the local authority regarding shared mobility options	○
3.There are different kind of shared mobility opportunities offered by companies available for citizens	○
4.There are more than five different kinds of MaaS operators providing combined mobility within the local authority covering the following modes: public transport, shared vehicles, shared bikes, ride sharing, rental cars, taxis, rental boats etc	○
5.Regular service providers (grocery stores, theatres, estate developers and housing companies etc) work together with MaaS operators and offer package deals to their customers	○
Public transport (PT)	
1.Customers can buy local PT tickets only via PT service providers' own channels, which differ from each other	○
2.Customers can buy the tickets to PT through several sales channels offered by third parties	○
3.The public transport authority (PTA) is actively connecting with other MaaS operators/transport providers in the area and they have plans to offer package deals to customers. (bicycle/car sharing, car pooling, taxis etc)	○
4.The PTA already offers multimodal package deals with other MaaS operators to customers	○
5.Hotels, theatres, shopping malls etc. regular service providers offer several service packages combiningPTA with their own services	○
SHARED UNDERSTANDING	
Integration platform	
1.The local authority has not opened data gathered from public transportation operation	○
2.PTA and the local authority have opened data/standardized information gathered so that third parties can use it to create new apps and services	○
3."Third parties already use open data and provide mobile applications (with information about one mode of transport or more than one, real time information, information about other services, official public transport applications etc.)"	○
4.The local authorities are promoting and facilitating a cooperation between different providers by any means (technical exchange platform, standardizations, etc.)	○
5.Third parties work together to sell their MaaS services by using the same apps as other private and/or public MaaS operators. The app may be provided by the PTA or a private service operator	○
Visibility – how obvious and easy to get are the shared mobility offers to the citizens	
1.Customers can find multimodal (min. 2 modes of transport) traveller information	○
2.Customers have several channels from which they can find multimodal traveller information	○
3.Customers get visuals or see campaigns on sustainable mobility options/MaaS services while travelling in the city"	○
4.Customers can change their means of transport easily in several places within the local authority (min 4 transport means in one place)"	○
5.Customers have found MaaS services and their usage has increased within the last year	○

Annex III - Multi-users lanes regulation (City of Turin)

CITTÀ DI TORINO

DELIBERAZIONE DELLA GIUNTA COMUNALE

29 settembre 2015

Convocata la Giunta presieduta dal Sindaco Piero Franco Rodolfo FASSINO, sono presenti, oltre al Vicesindaco Elide TISI, gli Assessori:

Maurizio BRACCIALARGHE

Ilda CURTI

Stefano GALLO

Assenti, per giustificati motivi, gli Assessori Stefano LO RUSSO – Domenico MANGONE - Gianguido PASSONI.

Con l'assistenza del Segretario Generale Mauro PENASSO.

OGGETTO: PROGETTO EUROPEO NOVELOG. SPERIMENTAZIONE PROGETTO PILOTA SULLA LOGISTICA URBANA DELLE MERCI. ISTITUZIONE DI NUOVO PERMESSO TEMPORANEO PER ACCESSO IN ZTL DA CONCEDERE AD UN LIMITATO NUMERO DI VEICOLI COMMERCIALI. APPROVAZIONE.

Proposta dell'Assessore Lubatti.

Coerentemente con i più recenti indirizzi dell'Unione Europea, nazionali e regionali già nel luglio 2008 Torino ha approvato le linee d'indirizzo del Piano Urbano della Mobilità Sostenibile (PUMS) per arrivare ad un reale riequilibrio della domanda di trasporto tra quello collettivo e quello individuale. L'obiettivo è ridurre la congestione e migliorare l'accessibilità alle diverse funzioni urbane con una politica della mobilità che favorisca davvero l'uso del trasporto collettivo e persegua con determinazione la sostenibilità del trasporto individuale e delle merci anche con divieti per i mezzi non ecologici ed attraverso un sistema integrato di trasporto che favorisca l'intermodalità e metta in opera servizi "puliti" di consegna delle merci.

La Città di Torino, inoltre - cogliendo la sfida europea delle Smart Cities volta a raggiungere

modelli di sviluppo urbano più sostenibili dal punto di vista energetico-ambientale, più intelligenti in termini di capacità di interconnessione ed interattività e più inclusive in termini di sostegno diffuso alla coesione sociale - ha intrapreso un percorso di pianificazione verso la "Città intelligente".

Tale percorso è iniziato nel 2009 con l'adesione al Patto dei Sindaci (*Covenant of Mayors*) ed è proseguito l'anno successivo con la redazione di uno specifico Piano d'Azione per l'Energia Sostenibile (*TAPE - Turin Action Plan for Energy*), con il quale la Città si è impegnata a ridurre consistentemente i propri consumi di energia e le proprie emissioni di CO2 entro il 2020, attraverso una maggiore efficienza energetica, un maggior ricorso alle fonti di energia rinnovabile e appropriate azioni di promozione e comunicazione.

Nel 2010 è stato, poi, adottato il Piano Urbano della Mobilità Sostenibile (PUMS) in coerenza con il "Piano d'azione sulla mobilità urbana" che la Commissione Europea ha comunicato nel settembre 2009 al Parlamento, al Consiglio, al Comitato economico e sociale europeo ed al Comitato delle Regioni. Il PUMS è stato sviluppato secondo una visione strategica che persegue il coordinamento di tutte le componenti del sistema della mobilità con scenari cadenzati nel tempo.

L'essersi dotata di tale Piano d'Azione ha dato alla Città, nel 2011, la possibilità di candidare Torino a Smart City, nell'ambito dell'omonima iniziativa comunitaria.

Al fine di affrontare al meglio la sfida della Smart City, la Città, oltre ad aderire a tali iniziative comunitarie, ha anche promosso la partecipazione a bandi europei e nazionali sul tema della "Città Intelligente" e, parallelamente, al fine di gestire al meglio il percorso intrapreso, ha proceduto a strutturare un piano strategico organico che andasse oltre i singoli progetti e individuasse, sulla base di una visione unitaria, gli assi prioritari di intervento nonché una serie di azioni chiave ad essi legate. È nato così il Masterplan "*SMILE - Smart Mobility Inclusion Life & Health and Energy*", approvato con deliberazione del Consiglio Comunale (mecc. 2013 07373/068) del 6 dicembre 2013. L'obiettivo è di sviluppare una città che, nel rispetto dell'ambiente, sia capace di produrre alta tecnologia, ridurre i consumi energetici degli edifici, promuovere trasporti puliti e migliorare in generale la qualità della vita dei suoi abitanti all'insegna delle basse emissioni di anidride carbonica.

In coerenza con tale percorso, la Città di Torino ha risposto, nel tempo, a numerosi bandi del Programma Horizon 2020 (H2020) che ha tra i suoi obiettivi la realizzazione di un sistema di trasporto europeo efficiente sotto il profilo delle risorse, rispettoso dell'ambiente, sicuro e regolare a vantaggio dei cittadini, dell'economia e della società al fine di conciliare le crescenti esigenze di mobilità sostenibile con i requisiti di una società a basse emissioni di carbonio e un'economia resiliente sotto il profilo climatico.

La Città di Torino ha pertanto aderito al Programma RIA di H2020, presentando alla Commissione Europea il Progetto "Novelog - New coopertaive business models and guidance for susteinable city logistics", ottenendo esito positivo all'accoglimento in data 28 gennaio 2015.

L'oggetto principale del progetto Novelog è realizzare nuove soluzioni per la razionalizzazione delle consegne delle merci in città al fine di diminuire la congestione del traffico e degli inquinanti.

Il progetto pertanto prevede la raccolta delle buone pratiche già realizzate nelle principali città europee, la raccolta dei dati del territorio, l'applicazione sulle città di alcune nuove soluzioni mirate, la costruzione di nuove policy cittadine da raccogliere in una guida che sarà consegnata come documento finale all'Unione Europea.

Con il progetto Novelog si continueranno le sperimentazioni già introdotte dal progetto pilota Pumas per concludersi con un'analisi dell'impatto che le misure adottate producono sulla circolazione nelle corsie riservate al trasporto pubblico, al fine di poter meglio valutare eventuali scelte future. L'area di ricaduta della sperimentazione sarà nuovamente quella della zona centrale cittadina (ZTL centrale) nel cui territorio saranno raccolti i dati del traffico tramite le infrastrutture telematiche di 5T. Gli aderenti alla sperimentazione Novelog saranno selezionati dai firmatari del Protocollo di Intesa siglato in data 27 settembre 2013 e successivamente approvato con deliberazione della Giunta Comunale in data 8 ottobre 2013 (mecc. 2013 04579/006) esecutiva dal 28 ottobre 2013, tra coloro i quali si sono impegnati ad adottare tutte le iniziative e/o le azioni rivolte a contenere le emissioni inquinanti derivanti dalla circolazione dei veicoli commerciali e dai portatori di interesse del settore della logistica merci selezionati dagli uffici della Direzione Infrastrutture e Mobilità.

Presupposti per la partecipazione alla sperimentazione sono:

- la consegna merci in zona ZTL centrale mediante veicoli commerciali di categoria Euro 5 o superiore o eco-compatibile o con alimentazione a metano, sagoma 35 quintali e massa a terra massima 50 quintali;
- l'utilizzo di dispositivi telematici, anche già istallati per altre funzioni, comunque in grado di rilevare e trasmettere a distanza dati riguardanti la localizzazione del veicolo e collegati alla centrale del traffico della Città di Torino (gestita dalla società 5T) tramite il protocollo SIMONE.

A fronte dell'impegno sottoscritto dai portatori d'interesse verranno riproposte le misure incentivanti, già adottate per il progetto pilota Pumas, quali:

- allargamento della finestra oraria di accesso alle ZTL centrale, romana, pedonale e Trasporto Pubblico incluse aree pedonali in ZTL, con esclusione della ZTL Valentino;
- accesso consentito per le operazioni di carico e scarico dalle ore 6:00 alle 24:00. Per le aree pedonali in ZTL centrale è consentita la circolazione esclusivamente per le operazioni di carico e scarico merci;
- gratuità del costo dei nuovi permessi temporanei per la circolazione nelle ZTL per il periodo della durata della sperimentazione;
- utilizzo di specifiche aree di carico/scarico in ZTL Centrale;
- utilizzo di corsie riservate al trasporto pubblico sull'intera Città anche non comprese in ZTL centrale.

Per dar corso alla sperimentazione, in considerazione delle attuali norme per l'accesso in ZTL, occorre istituire un nuovo permesso temporaneo, che avrà durata limitata a partire dal 1 ottobre 2015 fino al 30 settembre 2016, con possibilità di proroga successiva. Il contrassegno verrà consegnato gratuitamente ad un limitato numero di operatori della logistica merci in possesso dei requisiti come sopra descritto e aderenti alla sperimentazione tramite un atto formale di adesione. Il contrassegno dovrà essere esposto sull'autoveicolo autorizzato.

Agli autoveicoli muniti di tale contrassegno, in deroga alle attuali norme di accesso in ZTL e circolazione, sarà consentito:

- circolare nelle aree ZTL centrale, area romana, trasporto pubblico comprese le corsie riservate ed incluse aree pedonali in ZTL, ad esclusione della ZTL Valentino, dalle ore 6.00 alle ore 24.00. Per le aree pedonali in ZTL centrale è consentita la circolazione esclusivamente per le operazioni di carico e scarico merci;
- sostare negli appositi spazi riservati alla sosta (strisce blu) in Z.T.L., ottemperando al

pagamento della sosta durante l'orario di funzionamento dei parcheggi a pagamento e nelle zone ove la sosta è regolamentata da limitazioni temporali (disco orario) senza limiti di tempo per la sosta;

- accedere, all'esterno dell'area ZTL, alle corsie riservate ai mezzi pubblici e nelle aree pedonali dalle ore 6.00 alle ore 24.00 in Torino.

Tutto ciò premesso,

LA GIUNTA COMUNALE

Visto che ai sensi dell'art. 48 del Testo Unico delle leggi sull'Ordinamento degli Enti Locali, approvato con D.Lgs. 18 agosto 2000 n. 267, la Giunta compie tutti gli atti rientranti, ai sensi dell'art. 107, commi 1 e 2 del medesimo Testo Unico, nelle funzioni degli organi di governo che non siano riservati dalla Legge al Consiglio Comunale e che non ricadano nelle competenze, previste dalle leggi o dallo Statuto, del Sindaco o degli organi di decentramento;

Dato atto che i pareri di cui all'art. 49 del suddetto Testo Unico sono:

favorevole sulla regolarità tecnica;

viene dato atto che non è richiesto il parere di regolarità contabile, in quanto il presente provvedimento non comporta riflessi diretti o indiretti sulla situazione economico-finanziaria o sul patrimonio dell'ente;

Con voti unanimi, espressi in forma palese;

D E L I B E R A

1) di approvare, al fine di procedere alla fase sperimentale del progetto NOVELOG per la logistica delle merci, l'istituzione di un nuovo permesso in deroga alle vigenti norme di accesso in ZTL e circolazione;

2) di approvare le seguenti caratteristiche del nuovo permesso:

- durata limitata della validità dal 1 ottobre 2015 al 30 settembre 2016, fatta salva la possibilità di proroga con apposito atto deliberativo;
- rilascio gratuito da parte degli uffici della Divisione Infrastrutture e Mobilità del relativo contrassegno avente le caratteristiche fisiche di cui all'allegato (**all. 1**) ad un numero limitato di operatori della logistica merci in possesso dei requisiti come sopra descritto, con l'obbligo dell'esposizione a vista sull'autoveicolo autorizzato. Il permesso sarà revocabile in qualsiasi momento allorquando non saranno più rispettati i requisiti richiesti; inoltre, la sperimentazione potrà essere interrotta ad insindacabile giudizio dell'Amministrazione;

3) di approvare le deroghe alle attuali norme di accesso in ZTL e circolazione, consentendo, ai soli autoveicoli muniti del contrassegno di cui sopra, rilasciato alle condizioni come descritto in narrativa, di:

- circolare nelle aree ZTL centrale, area romana, trasporto pubblico comprese le corsie riservate ed incluse aree pedonali in ZTL , ad esclusione della ZTL Valentino, dalle ore 6.00 alle ore 24.00. Per le aree pedonali in ZTL centrale è consentita la circolazione esclusivamente per le operazioni di carico e scarico merci;
- sostare negli appositi spazi riservati alla sosta (strisce blu) in Z.T.L., ottemperando al pagamento della sosta durante l'orario di funzionamento dei parcheggi a pagamento e nelle zone ove la sosta è regolamentata da limitazioni temporali (disco orario) senza limiti di tempo per la sosta;
- accedere, all'esterno dell'area ZTL, alle corsie riservate ai mezzi pubblici e nelle aree pedonali, dalle ore 6.00 alle ore 24.00 nella città di Torino;

4) di dare atto che il presente provvedimento non comporta effetti diretti o indiretti sul Bilancio;
5) di dare atto che il presente provvedimento non rientra nei presupposti per la valutazione dell'impatto economico come risulta dal documento allegato (**all. 2**);
6) di dichiarare, attesa l'urgenza, in conformità del distinto voto palese ed unanime, il presente provvedimento immediatamente eseguibile ai sensi dell'art. 134, 4° comma, del Testo Unico approvato con D.Lgs. 18 agosto 2000 n. 267.

L'Assessore alla Viabilità,Infrastrutture,
Trasporti e Mobilità

Annex IV – Cycle logistics business planner (Source: cyclelogistics.eu)

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INTRODUCTION

This a business planning tool for Cycle Logistics companies. It has been developed by the CycleLogistics Consortium and is designed to help companies decide appropriate charges for the different services they offer. Based on the information you input, it will also provide a monthly breakdown of activity, an annual summary, and some useful performance indicators such as CO2 and fuel savings.

The greater the accuracy of the information you input, the more useful and accurate a plan this tool will produce

GUIDELINES

The business planner is made up of two input sheets (*black tabs*), three summary sheets (*orange tabs*), and the supplementary 'Contract Planning' sheet. For ease of use, any cells into which data may be input are shaded grey. This data filters through into the summary sheets. Some of the formulae in the non-input cells will only work when **all the sheets** are filled in.

Income

In the **DELIVERY SERVICE** section input the different types of service you expect to offer, the profit margin you would like to make, the number of drops and parcels per day, number of days per year this service will be provided and the estimated time in minutes you expect each drop to take. This last variable is important as it calculates the number of staff hours required per year for that particular service.

If you expect to generate any income from advertising, then use the **ADVERTISING INCOME** section. This requires a brief description, the charge per day, and the number of days per year.

Expenditure

RIDER COSTS
The information from the **DELIVERY SERVICE** section of the income sheet will now appear in this section of the expenditure sheet. Input an hourly rate you expect to pay the rider delivering that service in *column C* , the percentage figure for national insurance and pension contribution in *column E*, and an estimation of the number of weeks holiday and sick you expect that rider to take per year in *column F*. This calculates the annual staff cost for providing that particular service.

REPAIRS, MAINTENANCE & SERVICING
Estimate the annual cost per bike of any maintenance & repairs and input this figure in *cell E31* , if necessary you can add a contingency budget percentage in *cell E32* . The number of bikes will be automatically calculated from the information you input in the **DEPRECIATION** section.

DEPRECIATION
Use this section to calculate the annual charge for depreciation. Use *column C* to input the different types of bike in your fleet, *column D* for the original capital cost, and *column E* for the expected working life of the bike.

INSURANCE
Input the description and costs for the different types of insurance your organisation is liable for.

OVERHEADS AND MANAGEMENT
Use this section to estimate costs for management time, office, legal and professional, and marketing. There are 2 free lines for you to input other costs not covered by these pre-populated ones.

If your organisation has a central costs contribution (for example, you may be part of a larger organisation to whom you pay costs), then input the percentage contribution in *cell D66* .

This should now provide a **total expenditure** figure in *cell G88.* This information is used to calculate the suggested tariff per parcel which now appears on the income sheet in *column D.*

Summary sheets

The information is now conveniently summarised in the sheets with **orange tabs**. The only other input is the '*average speed*' figure in *cell C14* in the **'Profit & Loss account & KPIs'** sheet. This calculates the cost per mile (or kilometre) of your service, and also provides an estimation of CO2 and fuel savings.

Contract Planning

The contract calculator is a useful addition when quoting for contract jobs, **but it does rely on you having already filled in the data described above** in order to generate some of the estimated costs per hour. This sheet is self explanatory; fill in the cells that are shaded grey, not forgetting the profit margin you would like to make delivering the contract. This will generate a suggested charge per parcel.

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INCOME

DELIVERY SERVICE : PRODUCT MIX

Brief Description	Profit Margin	Suggested tariff per parcel	Est. drops per day	Est. parcels per day	Working days per annum	Daily income	Time per drop (minutes)	Annual income
Same day service	*25%*	*5,00*	*2*	*4*	*260*	*20,00*	*40*	*5.200*
DELIVERY SERVICE INCOME								-

ADVERTISING	Brief Description	Charge per day	Number of days	Income
Example	*Monthly advert on Bullitt*	*1,00*	*30*	*30,00*
Advertising Product 1				
Advertising Product 2				
Advertising Product 3				
ADVERTISING INCOME				-

TOTAL INCOME	-

Cycle logistics business plan: INCOME sheet

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EXPENDITURE

COST OF SALES

RIDER COSTS	Hourly rate	Man hours required / year	NI / Pension Contribution (%)	Holiday & Sick leave (weeks p/a)	Rider Cost p/a
Example	*7,00*	*346,0*	*20%*	*6*	*3.186*
TOTAL RIDER COSTS					-

REPAIRS, MAINTENANCE & SERVICING	Number of bikes	Cost per annum / per bike	Cost per annum
Repairs, maintenance & servicing	0		-
Contingency budget	Input Percentage:		-
TOTAL REPAIRS, MAINTENANCE & SERVICING			-

TOTAL COST OF SALES -

EXPENSES

DEPRECIATION	Description	Purchase cost	Est. life (years)	Depreciation charge p/a
Example	*Bullitt*	*2.000*	*5*	*400*
Bike 1				
Bike 2				
Bike 3				
Bike 4				
Bike 5				
TOTAL DEPRECIATION				-

INSURANCE	Description	Cost per annum
Example	*Public liability*	*500*
Insurance 1		
Insurance 2		
Insurance 3		
TOTAL INSURANCE		-

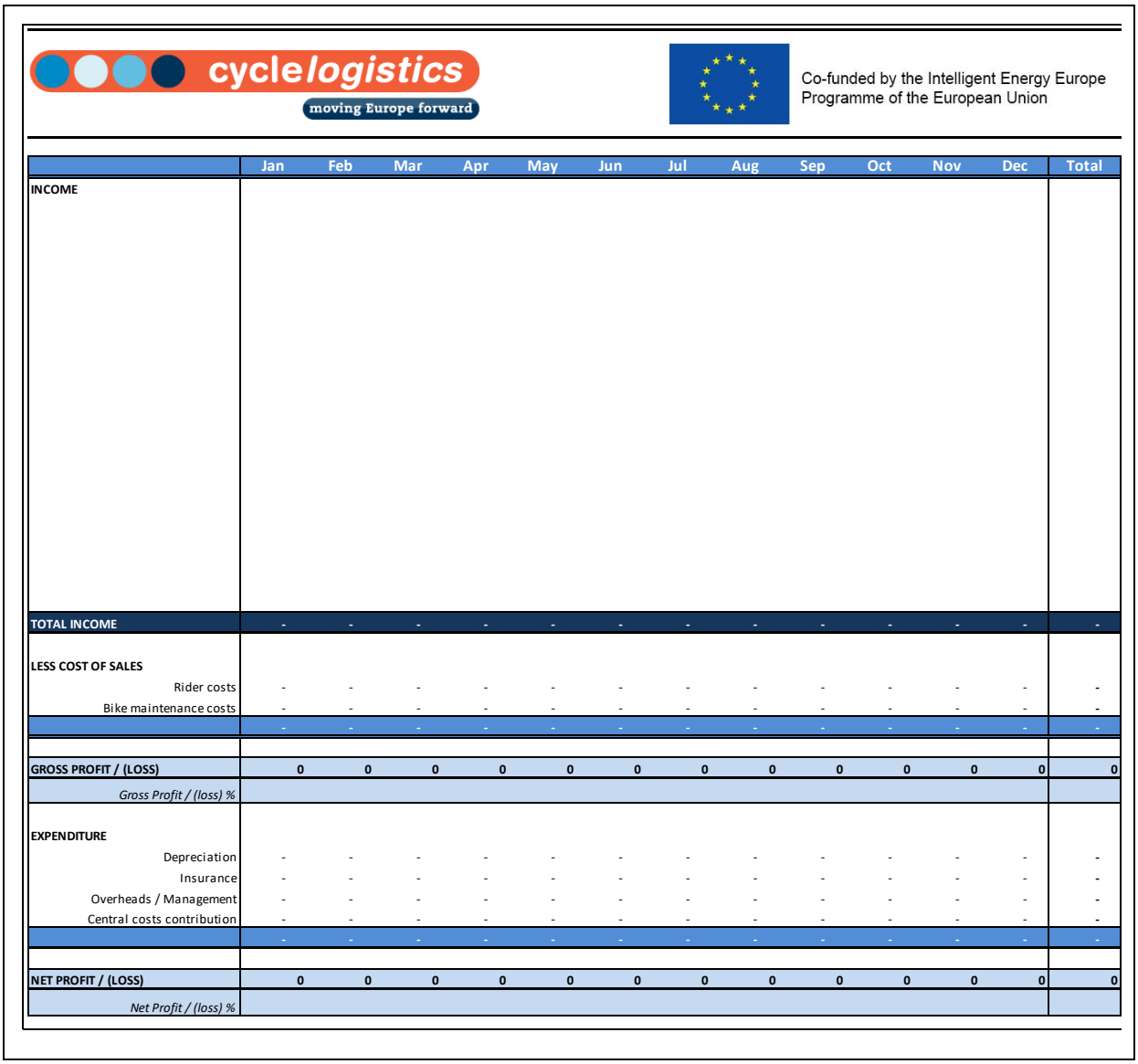
OVERHEADS & MANAGEMENT	Cost per annum
Management time	
Office costs (rent, phone , IT, admin, stationery)	
Legal & Professional	
Marketing	
TOTAL OVERHEADS & MANAGEMENT	-

SUB-TOTAL EXPENSES -

CENTRAL COSTS CONTRIBUTION Input percentage: -

TOTAL EXPENDITURE -

Cycle logistics business plan: EXPENDITURE sheet



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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
INCOME													
TOTAL INCOME	-	-	-	-	-	-	-	-	-	-	-	-	-
LESS COST OF SALES													
Rider costs	-	-	-	-	-	-	-	-	-	-	-	-	-
Bike maintenance costs	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-
GROSS PROFIT / (LOSS)	0	0	0	0	0	0	0	0	0	0	0	0	0
Gross Profit / (loss) %													
EXPENDITURE													
Depreciation	-	-	-	-	-	-	-	-	-	-	-	-	-
Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-
Overheads / Management	-	-	-	-	-	-	-	-	-	-	-	-	-
Central costs contribution	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-
NET PROFIT / (LOSS)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Profit / (loss) %													

Cycle logistics business plan: MONTHLY ANALYSIS sheet

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ANNUAL SUMMARY

Income	Annual Income
Delivery work	-
Advertising	-
Grand-Total: Income	-

Cost of Sales	
Rider Costs	-
Bike maintenance costs	-
Total Cost of Sales	-
GROSS-PROFIT / (LOSS)	0
Gross-profit / (Loss) %	

Expenses	
Depreciation	-
Insurance	-
Overheads & management	-
Central costs contribution	-
Total Expenses	-
NET-PROFIT / (LOSS)	0
Net-profit / (Loss) %	

Cycle logistics business plan: ANNUAL SUMMARY sheet

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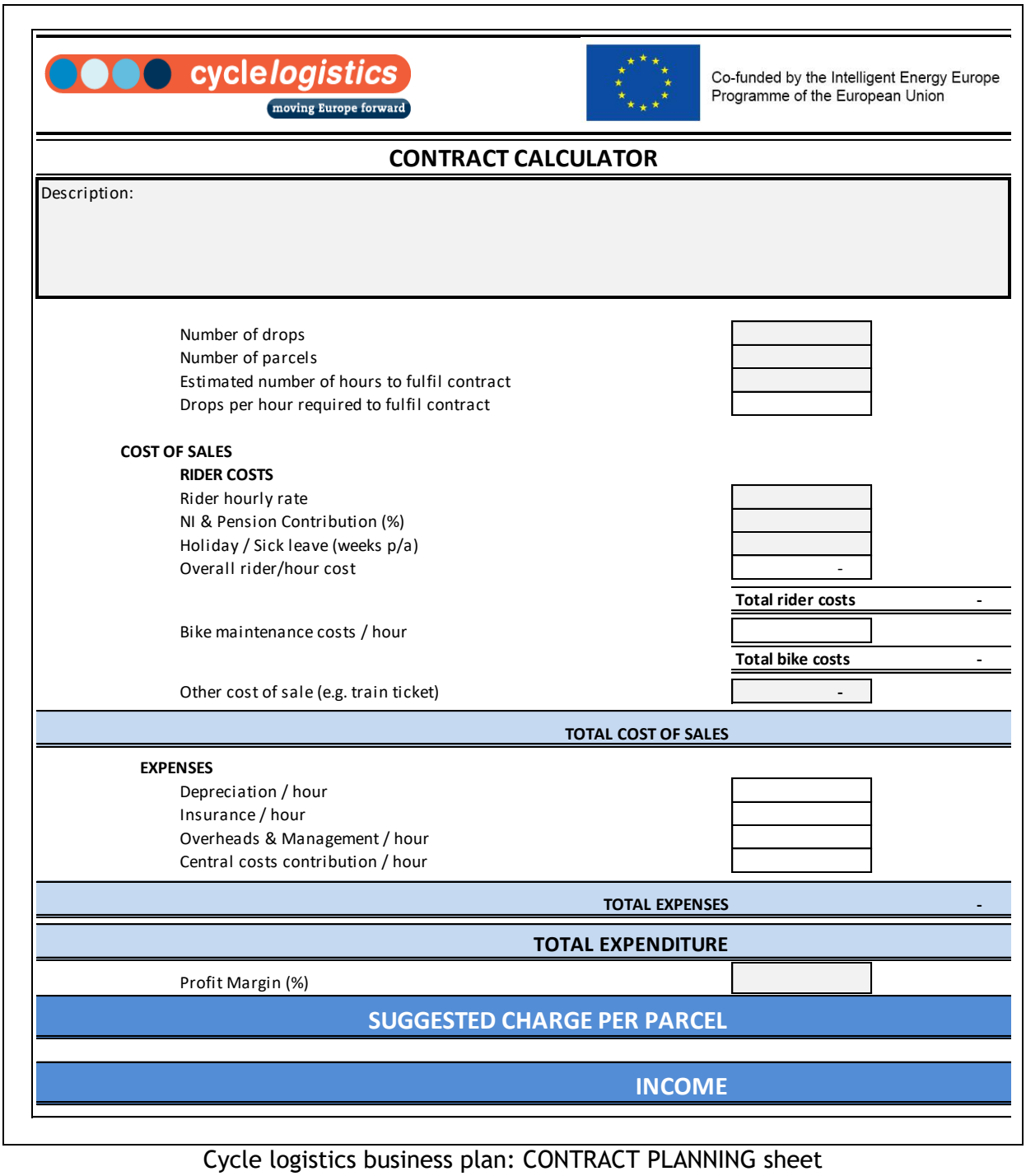
CycleLogistics Business Planner - Summary Profit & Loss Account

Profit & Loss Account	£ / €	
Turnover	-	
Less Cost of Sales		-
Gross Profit	-	
Less Expenses		-
Net Profit	-	

KPIs		
Average Speed (mph or kph)		
Rider hours / Year		-
Total miles per year		-
Costs per mile/km:		
Bike		
Rider		
Expenses		
Overall cost per mile/km		
Costs per hour:		
Bike		
Rider		
Expenses		
Overall cost per rider hour worked		
CO2 savings (kg/year)		-
Fuel Savings (kg/year)		-

Cycle logistics business plan: PROFIT & LOSS sheet



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CONTRACT CALCULATOR

Description:

Number of drops		
Number of parcels		
Estimated number of hours to fulfil contract		
Drops per hour required to fulfil contract		
COST OF SALES		
RIDER COSTS		
Rider hourly rate		
NI & Pension Contribution (%)		
Holiday / Sick leave (weeks p/a)		
Overall rider/hour cost	-	
	Total rider costs	-
Bike maintenance costs / hour		
	Total bike costs	-
Other cost of sale (e.g. train ticket)	-	
	TOTAL COST OF SALES	
EXPENSES		
Depreciation / hour		
Insurance / hour		
Overheads & Management / hour		
Central costs contribution / hour		
	TOTAL EXPENSES	-
	TOTAL EXPENDITURE	
Profit Margin (%)		
	SUGGESTED CHARGE PER PARCEL	
	INCOME	

Cycle logistics business plan: CONTRACT PLANNING sheet

Annex V – Summary of the set up and running costs of operating a delivery service using cargo bike versus traditional van (Source: cyclelogistics.eu)

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Cargo Bikes - The Economic Argument (September 2011)

The following table provides a summary of the set up and running costs of operating a delivery/courier service using cargo bike versus traditional white van. The indicated amounts are all based on real costs.	Cargo Bike (8Freight) 	Van (VW Caddy 1.6 Diesel) 
Tangible Costs		
Set Up Costs:		
Purchase Cost	£1,900	£2,880 per annum (3 yr contract hire,10,000 miles pa)
Running Costs:		
Annual maintenance	£150	Included in contract hire cost
Fuel	Zero	£1,128 pa (10,000 miles per year, 56 mpg/12.32 mpl)
Vehicle Excise Duty	Zero	£165 pa
Vehicle Insurance	£120 pa	£500 pa
Rider/Driver costs:		
Hourly pay rate	£7.50	Usually self employed paid by delivery eg £2.00 per delivery
Service Insurance:		
Goods In Transit Insurance	Difficult to organise	£145 for £10,000 of cover (example from forum COD)
Intangible Costs		
Emissions Contribution	Zero	152g/km CO2
Congestion Contribution	Minimal impact	Another vehicle on the road contributing to congestion
Noise	None	Diesel Clatter
Average speed in City	12 mph	12 mph
Parking	Not a problem	Restricted (risk of parking ticket)
Flexibility	Access to pedestrianised areas and cycle paths	Restricted to the road network
Range	50 miles per day	Unlimited
Contribution to rider/driver health	Rigorous daily workout	Sedentary
Example Delivery Costs (Cambridge)		
Example Delivery 1:		
- A4 Box - Collect by 10am, deliver by 5pm - From CB30AY to CB40AY (2 miles)	£2.95 +VAT (£3.54)	£8.50 +VAT (£10.20) Cambridge Van Courier 1 £7.95 +VAT (£9.54) Cambridge Van Courier 2
Example Delivery 2:		
- 3 x A4 Boxes - Collect by 10am, deliver by 5pm - From CB30AY to CB40AY (2 miles)	£4.95 +VAT (£5.94)	£8.50 +VAT (£10.20) Cambridge Van Courier 1 £7.95 +VAT (£9.54) Cambridge Van Courier 2
Example Delivery 3:		
- 6 x A4 Boxes - Collect by 10am, deliver by 5pm - From CB30AY to CB40AY (2 miles)	£6.95 +VAT (£8.34)	£8.50 +VAT (£10.20) Cambridge Van Courier 1 £7.95 +VAT (£9.54) Cambridge Van Courier 2

Issues:
- as the business grows the storage/garaging of cargo bikes can become an issue (you can park a van in a street - but a cargo bike needs to be kept in a secure location)
- alternate cargo bikes to consider include Cycle Maximus (www.cyclemaximus.com) and Bullitt (www.larryvsharry.com)

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Tangible Costs		
Set Up Costs:		
Purchase Cost	€ 2.205	€ 3.343 per annum (3 yr contract hire, 10,000 miles pa)
Running Costs:		
Annual maintenance	€ 174,11	Included in contract hire cost
Fuel	Zero	€ 1.309 pa (10,000 miles per year, 56 mpg/12.32 mpl)
Vehicle Excise Duty	Zero	€ 191,52 pa
Vehicle Insurance	€ 139,28 pa	€ 580,35 pa
Rider/Driver costs:		
Hourly pay rate	€ 8,71	Usually self employed paid by delivery eg € 2,32 per delivery
Service Insurance:		
Goods In Transit Insurance	Difficult to organise	€ 168,30 for € 11.607 of cover (example from forum COD)
Intangible Costs		
Emissions Contribution	Zero	152g/km CO2
Congestion Contribution	Minimal impact	Another vehicle on the road contributing to congestion
Noise	None	Diesel Clatter
Average speed in City	12 mph	12 mph
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Example Delivery Costs (Cambridge)		
Example Delivery 1:		
- A4 Box - Collect by 10am, deliver by 5pm - From CB30AY to CB40AY (2 miles)	€ 3,42 +VAT (€ 4,11)	€ 9,87 +VAT (€ 11,84) Cambridge Van Courier 1 € 9,23 +VAT (€ 11,07) Cambridge Van Courier 2
Example Delivery 2:		
- 3 x A4 Boxes - Collect by 10am, deliver by 5pm - From CB30AY to CB40AY (2 miles)	€ 5,75 +VAT (€ 6,89)	€ 9,87 +VAT (€ 11,84) Cambridge Van Courier 1 € 9,23 +VAT (€ 11,07) Cambridge Van Courier 2
Example Delivery 3:		
- 6 x A4 Boxes - Collect by 10am, deliver by 5pm - From CB30AY to CB40AY (2 miles)	€ 8,07+VAT (€ 9,68)	€ 9,87 +VAT (€ 11,84) Cambridge Van Courier 1 € 9,23 +VAT (€ 11,07) Cambridge Van Courier 2

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