New Cooperative Business Models and Guidance for Sustainable City Logistics

Objectives and Approach
NOVELOG is a three-year research project focusing on gaining insight into urban freight transport (UFT) and providing guidance for implementing effective and sustainable policies and measures. This guidance has been given through a 4 step - 4 tool approach aiming to help cities “Understand” their UFT environment, “Focus” on the most suitable measures and policies, “Assess” these measures and “Guide” the cities in their effective implementation.

12 cities and regions are involved in the project: Athens, Barcelona, Copenhagen, Emilia-Romagna Region, Gothenburg, Graz, London, Mechelen, Pisa, Rome, Turin, and Venice.

Each city has specific as well as common priorities and needs, different maturity level, different mix of measures and interventions, but the same objective: a more sustainable and liveable city. To this end, they have developed a pilot or case study to achieve the following results and impacts:

- Cost effective and green (non-vehicle technology) strategies, measures and business models
- Increased load factors and reduced vehicle movements
- Optimised governance and stakeholder cooperation in urban distribution, through a more powerful, consensus-oriented Decision Support System (DSS)
- Strengthened capacity of local authorities & public and private stakeholders for sustainable policy making and mobility planning

These activities have been accompanied by the production of the NOVELOG SULP Guidelines and the NOVELOG tools: Understanding the Cities Tool, Toolkit, Evaluation Tool, and Guidance Tool are expected to support the uptake impact of NOVELOG project to wider international city and industrial networks and beyond the project’s lifetime.

Outcomes
All the NOVELOG Deliverables, including the NOVELOG SULP Guidelines and Roadmap are available at http://novelog.eu/downloads-2/downloads/

The NOVELOG Tools can be found on the NOVELOG Platform:
http://www.uct.imet.gr

Understanding the Cities Tool: http://www.uct.imet.gr/UC-Tool
Evaluation Tool: http://www.uct.imet.gr/Evaluation-Tool
Toolkit: http://www.uct.imet.gr/Novelog-Tools/Toolkit
Guidance Tool: http://www.uct.imet.gr/Yellow-Pages

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Contribution of all the cities and regions involved in the project
NOVELOG Cities & Regions factsheets

The 13 factsheets compiled in this publication describe the pilots and case studies developed by the NOVELOG cities and regions.

04 Athens (Greece) – Integrating efficient city distribution to environmentally-friendly inter-urban transportation
06 Barcelona (Spain) – AreaDUM App
08 Barcelona (Spain) – Micro-distribution platforms
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16 Gothenburg (Sweden) – Logistics consolidation
18 Graz (Austria) – Mitigation of freight traffic in the city centre
20 London (UK) – Development of a Freight Plan
22 Mechelen (Belgium) – Urban distribution centre for bike services & parcel lockers system
24 Pisa (Italy) – Access of freight vehicles
26 Rome (Italy) – Design & development of a Decision Support System (DSS) for freight distribution planning and monitoring
28 Turin (Italy) – Stimulating the replacement of highly polluting freight vehicles
30 Venice (Italy) – Promoting of better integration & connections to urban remote areas
In brief

Athens pilot in the frame of NOVELOG project focused mainly on two core elements:

- Cargo deliveries from Thessaloniki to Athens using rail for long-haul transport and trucks for collection and last-mile delivery
- Stakeholder collaboration for reducing the number of vehicles in the city centre

Within the first element of the pilot, collection and groupage of the goods in Thessaloniki to full or near-full container loads was operated by SYNERGY. They were later transported to Athens by train by TRAINOSE. In the second element of the pilot, the city of Athens cooperated with local stakeholders and encouraged the cooperation among the stakeholders in order to increase the load factor of the trucks entering the city thus reducing the number of vehicles in the city center.

Context

The area of interest (or influence) comprises a considerable number of blocks within the commercial and historical city center. Aiming at the transformation of Athens from a typical congested city to an international, liveable and sustainable smart city, a systematic and integrated strategic plan has been compiled. The plan constitutes the base and reference point towards the establishment of an integrated Sustainable Urban Mobility Plan (SUMP), also incorporating Urban Freight Transport (UFT) activities (towards Sustainable Urban Logistics Plan - SULP). The plan’s priority is the competitiveness, the social cohesion and the social/natural environment protection and preservation.

A roadmap has been introduced by the local, regional and national authorities. This is the “Integrated plan on city-oriented interventions for Athens”, considered by the local and regional authorities to be fundamental towards the setting of a basis where the SUMP (also incorporating the SULP) will be based on.

In action

In the case of cargo deliveries by rail, TRAINOSE developed an internet-based data collection and information exchange platform, the so-called “intermodal pallet shuttle service”. This service constitutes a web-platform where a customer has the opportunity to book the place for groupage transportation instead of full container load. The track and trace system for the monitoring of cargo and respective vehicles has already been planned to be upgraded, providing real-time data throughout the whole supply chain.

In the second element of Athens pilot, the main objective was to examine how the cargo consolidation in last mile distribution - through stakeholders’ cooperation - affects the urban freight transportation operations and environment. A detailed volume map was acquired from the company Attiko Metro S.A. including the truck volumes of the main road network for the city of Athens. Based on this volume map, two different zones of interest
were selected: the municipality of Athens and
the historic center of the city. A number of
business and expert group meetings took place
with several logistics experts, supply chain
stakeholders (3PL operators, logistics service
providers, transport & mobility consultants)
and public authorities. The main aim of these
meetings was building consensus among the
different stakeholders on the current and
future state of Athens UFT i.e. which are the
main factors influencing the city’s UFT-through
the use of the web-based NOVELOG tool UCT-
as well as the collection of the necessary data
in order to better understand the city’s UFT in
terms of environmental burdening as well as
mobility and safety issues. The qualitative and
quantitative information collected was used to
create a new volume map for the two zones of
interest, showing the significant decrease in the
volume of trucks entering the city that come up
from the potential stakeholders’ collaboration.

Results
The ability for the service developed in the
first element of Athens pilot is one container
per week (20 pallets). The long-term
implementation service is expected to offer
30 containers per week (600 pallets).
There will be significant advantages for
the customers such as price stability, loyalty
bonus for repeated customers and live support
thus making the service very attractive.

In the second element of Athens pilot, the
stakeholder collaboration for the last-mile
deliveries will significantly increase the load
factor of the trucks entering the city, and
consequently, the number of trucks entering
the city will be reduced. More specifically,
the implementation of stakeholder
collaboration on the last-mile distribution
in Athens may lead to an increase of the load
factor from 21% to 24% and consequently
a decrease in the number of trucks entering
the city (23% for Attica region 34% for Athens
municipality). The expected reduction of
truck volumes will have a positive impact on
congestion reduction, emissions decrease,
noise reduction and safety improvement.

Challenges, opportunities
and transferability
For the city of Athens, it is critical to update
the old-fashioned logistics framework that
regulates the whole region. It should be
updated upon today’s needs and requirements,
especially in the commercial triangle of
the city. Based on NOVELOG experience,
cargo consolidation for last-mile distribution
- through either stakeholder cooperative
schemes or through the implementation of
an intermediate urban consolidation centre-
could contribute to the streamlining of Athens
city logistics. The establishment of many
more “special” parking slots in combination
with proper police patrolling would further
improve the UFT environment of the city. In
parallel, limiting (for short-time) the roadside
parking for residents and visitors with the use
of off-road parking spaces, in addition with the
use of smaller and/or environmental friendly
delivery vehicles, would greatly enhance the
urban transport but also the environmental
conditions of the city.

The adoption by the city of Athens of the
proposed measures and actions is expected
to contribute significantly to the future UFT
mainly in terms of increased load factor,
reduced truck volumes and reduced vehicle’s
kilometres driven.
Pilot: Micro-distribution platforms

In brief
The NOVELOG micro-distribution pilot in Barcelona aims to improve the efficiency of urban goods distribution. The last-mile deliveries are performed by cargo-trikes, consolidating goods in two micro-platforms. The idea is that the development of sustainable city logistics strategies can help achieve significant emission reductions.

In action
Built on a pilot developed within the framework of the Interreg project SMILE, the NOVELOG micro-platform pilot envisages last-mile deliveries, replacing polluting vehicles with electric and mechanical traction bicycles or tricycles. This system doesn’t have the restriction of the ‘time windows’. In the first phase of the pilot, extensive research was conducted to identify the most appropriate spaces to install the micro-platforms, intended as dynamic and flexible transhipment points. The Mobility Services Department searched for various types of off-street public premises, municipal markets, car parks, some public transport stations, and other spaces owned or leased by the City Council. Two sites were secured, and negotiations with candidate Last-Mile Operators (LMOs) then took place in parallel to the refurbishment of the sites. The micro-platform at Estació de França was assigned to vanAPEDAL, whereas ECOPOL took up the concession of the El Ninot market platform. The municipality designed the micro-platform as a concession of public spaces (zero cost to the last mile operators). In return, the LMO had to be a neutral operator, working with all carriers. Moreover, they had to provide data to the municipality, so they could improve the knowledge and the system. CENIT, the local transport research and NOVELOG partner, coordinated the evaluation work of the NOVELOG trial, and a consultant (Doymo) was sub-contracted by Mobility Services to establish the reporting template and compilation of data about delivery activities of the LMOs. The El Ninot platform started operating during the summer of 2016, whilst the Estació de França site was ready to operate only in January 2017. The assessment plan
was formulated by CENIT and agreed at the periodic meetings with the consultant Doymo who liaised with LMOs. The consolidated trials ran from January to May 2017, with monthly meetings, results reporting and assessing progress with collected data.

**Results**

From January to May 2017, some 14 delivery tours were made each weekday, primarily by cargo-trikes. Each tour delivered a daily average of 56 parcels. In total, over 80,000 parcels were delivered (a monthly average of 16,301). Thus, the micro-distribution pilot contributed positively to greenhouse gas emission targets, improving air quality in streets with a high concentration of pedestrians, and overall to Barcelona’s SUMP goals. This improvement is due both to the use of zero-emission vehicles and to the reduced number of vehicle kilometres driven by conventional vehicles to perform deliveries, since e-bikes replace them. Throughout the pilot, the bikes and trikes of the two hubs covered 19,000 km, saving an estimated 9,472 kg in CO2 emissions. The same deliveries would have needed approximately 36,000 truck vehicle-kilometres.

**Challenges, opportunities and transferability**

Following the success of the micro-platform pilot, LMOs have increased their activities with cargo-bikes. The number of public platforms needed to achieve a city-wide service may, therefore, be reduced. The operator ECOPOL opened a second private platform, which resulted in a decrease in the volume of deliveries from the Estació de França platform. Although the total number of deliveries by cargo-bike is almost-certainly increasing, only a part of the deliveries is realised via platforms where a space-for-information concession from the Municipality is in place. Therefore, a challenge related to the micro-platform pilot is certainly associated with the interaction of public and private interests in this new and rapidly-changing market.

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<tr>
<th>Impact Assessment results</th>
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<tr>
<td><strong>CO₂</strong></td>
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<tr>
<td>Traffic throughput</td>
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<td><strong>CH₄ &amp; NO₂</strong></td>
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<td>Noise</td>
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<td>Load factor</td>
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not favourable  →  favourable
Case Study: AreaDUM App

**In brief**
The Case Study implemented in the city of Barcelona is the AreaDUM App, a mobile application which aims at better management of on-street delivery spaces by integrating new technologies in the urban freight system.

**Context**
The development of the AreaDUM App falls within the scope of Barcelona’s 2013-2019 Sustainable Urban Mobility Plan (SUMP), which foresees the incorporation of new technologies in mobility management. AREA was implemented in Barcelona in November 1983. It is an integral regulation system for on-street parking where all the spaces are regulated by rules and fees. There is a wide range of parking spaces reserved for goods deliveries across the city, defined according to the particularities of each site. There is a time limit of 30 minutes for each operation.

**In action**
The regulations allow 30 minutes for the un/loading operation. The driver of the vehicle was obliged to indicate the time of arrival using a cardboard disc. Towards the end of 2015, the cardboard disc was replaced by a mobile app, AreaDUM. The AreaDUM App was first tested and implemented in late 2014 in Passeig de Gràcia, one of the main shopping and business avenues in the city centre. Following a mobility agreement between the City Council, the Transport guild, the public services company B:SM and other local stakeholders, the app was extended to the rest of the city in 2015 and became compulsory in November of the same year. It became the only means by which commercial vehicles can use the 8,500 on-street spaces dedicated to goods un/loading, which lead to an increase in the volume of transactions.

**Results**
Some interesting results emerge from the analysis of the AreaDUM App data. While the intensity of operations by time of the day was already known thanks to other studies, the data analysis indicates that each day, one-third of the delivery vehicles only make one delivery operation. Furthermore, a geographic difference in the use of the app emerges from the analysis.

**Challenges, opportunities and transferability**
The Mobility Services Department has an on-going interest in the data being generated by the app and is considering making another study to update the findings. The new function of space occupancy prediction will also be assessed. The authority of the metropolitan area of Barcelona, AMB, is interested in extending the service beyond the City of Barcelona. The interest shown by cities such as Lyon and Hamburg in the presentations of the project suggests that the experience could be replicated elsewhere in Europe.
In brief
The city of Copenhagen has developed the Freight Network within the NOVELOG-project. The network facilitates dialogue and enables cooperation among public and private stakeholders of urban freight transport. The members collectively improve their understanding of current logistics services (data collection) and future scenarios on freight network for defining incentives to improve demand management pertaining to urban freight transport activities. The dialogue and partnerships focus on improving the logistics operations of companies achieving economic and energy savings. Improved logistics operations result in reductions in travel time and energy (fuel) consumption.

Context
The City of Copenhagen has a population of about 600,000 people with high urban related business and activity. Significant inconsistencies have appeared in the transport sector and urban logistics are characterized by a large number of freight flows and service trips resulting in many vehicle kilometres travelled and corresponding pollutant emissions. Additionally, the overall goal of the City of Copenhagen is to become carbon neutral in 2025. The introduction of the Freight Network is an open triple helix network for all stakeholders with interest in improving the situation for goods deliveries within the Copenhagen city. The overall aim is to reduce the externalities from freight within the city such as climate impacts, noise and air pollution. In 2025, 30-40% of heavy transport activities in the City of Copenhagen are to use renewable fuel.

In action
The City of Copenhagen’s Frame of Reference states that the Freight Network has three meetings yearly. The agenda is based on the proposed topics of the members. Four weeks before the meetings the agenda is distributed and each member can add a new topic for discussion up to two weeks before the date of the meeting. The implementation process involved setting up and keeping the Freight Network operational with a series of meetings and surveys. This has among other things resulted in a special data-based analysis on trucks in Copenhagen, giving unique data and insights into the truck movements and type of commodities handled both at the city level and with respect to specific geographic areas in the city. Moreover, a behavioural survey and analysis of stakeholders regarding energy efficiency and environmental consciousness, as well as a behavioural survey and analysis of stakeholders regarding their participation in the freight network were carried out to understand if the network address relevant
problems were conducted. This has constituted the basis for future interventions promoting energy efficient and environmental friendly logistics solutions.

Results
Setting up the urban Freight Network involved significant efforts and continuous communication activities with the different stakeholder groups. Therefore, more time was required as this step was a prerequisite for starting the data collection. Private operators did not participate actively in the data collection process. Instead, a data collection framework was developed (in collaboration with the Technical University of Denmark) to extract the relevant information from the National Truck Survey. Two partnership agreements have been successfully established to implement pilot actions, and more are coming up during the last project period. In general, the perception of the effectiveness and overall interest on the Freight Network is positive, and it will be continued beyond NOVELOG. The evaluation of the network will be kept repeatedly active to monitor effectiveness and assure to capture the interest of the stakeholders participating.

Challenges, opportunities and transferability
The Freight Network aims to enhance cooperation between the public and private sector. The overall focus is to co-build the Sustainable Urban Logistics and Freight Plan of the area including expected future scenarios and long-term trends (such as e-commerce) that affect urban freight distribution.

An official network can support cooperation between industry, research community and public authorities, ensuring operational and environmental improvements in the area. Cooperation among private and public sectors can support strategical decisions and improve stakeholders’ general behaviour regarding sustainable UFT. Collecting data from the private sector is a very demanding and time-consuming process. Initiatives for urban logistics should consider the different priorities of stakeholders in order to be successful. The engagement of the private sector can affect decision making and enhance their environmental consciousness. Continuous communication activities and physical meetings are important to coordinate actions. The evaluation of the network is necessary to capture how participants perceive that their problems and needs are addressed.
In brief

In the Emilia-Romagna region, three Case studies were carried out. The first case had a regional perspective, with Emilia-Romagna government acting as the protagonist. The second and third cases were carried out in collaboration with the city of Reggio Emilia and the city of Bologna, respectively. Overall, the study aimed at mitigation of the negative impacts of freight mobility in city centers and support Emilia Romagna cities’ SULP planning.

The first case study concerned the Emilia-Romagna territory. It aimed at improving the harmonization of access permission procedures on a regional basis (Emilia-Romagna), by focusing on the development of an IT tool prototype as a centralised front-end web portal, connecting users with cities’ services. Also, this case study aims at supporting an administrative simplification of municipal level urban logistics rules on a regional scale, by sharing and harmonizing information and procedure among cities, in terms of access permission of freight vehicles to Limited Traffic Zones (LTZ).

In Reggio Emilia, a medium-sized city in Emilia-Romagna region, the case study focused on business and transport operational plan development and assessment. In particular, it investigated the use of an existing parking area as an urban distribution centre, to be served by electric vehicles or other zero/low pollutant vehicles (e.g. Cycling logistics).

In Bologna, the case study intended to assess the feasibility of a very preliminary home delivery system and e-commerce platform for city center shops.

Context

Emilia-Romagna region is located in Northern Italy and has an area of about 22,446 km² with a population of 4.4 million inhabitants. The region consists of nine provinces, and Bologna is the capital. Emilia-Romagna is one of the richest European regions and the third in Italy considering GDP per capita. This is due to a well-balanced economy which comprises the Italian biggest agricultural sector and also automotive, motor and mechanical components manufacturing sectors.

Emilia-Romagna is a pivotal region in Italy, connecting North with South and North-West with North-East. Freight transport situation provides a snapshot of the need for actions and policies. An estimated 281 million tons per year are transported throughout the region by road, 85% of which has origin or destination within the region. Moreover, about 70% of intra-regional freight flows are characterized by an origin-to-destination trip distance under 50 km. Also, about 470,000 registered freight vehicles circulate in the region, 86% of which are under 3.5 tons. Moreover, Emilia-Romagna region is characterized by a strong urban sprawl, with continuity and merging of contiguous urban settlements, which brings regional challenges in a city logistics perspective and SULP preparation. Emilia-Romagna region acts as coordinator for the activation of city logistics rules and founding processes at the municipal level. The actions developed by the Region started in the framework of the Air Quality Agreements, with the aim of reducing traffic congestion as well as pollutant emissions. Following the Air
Quality Agreement 2012 – 2015, the Emilia-Romagna Regional Council, supported by ITL, with the main Municipalities over 50,000 inhabitants, defined and agreed on a set of city logistics rules, targeting freight vehicles under 3.5 ton in third-party account transport. The rules comprise time windows and access restrictions to LTZ.

The second case study, the area of influence is Reggio Emilia city centre. Reggio Emilia is a historic city in Emilia-Romagna of about 170,000 inhabitants (a typical medium-sized city). The total loading and unloading operations per year in Reggio Emilia centre is about 620,000, with a significant impact on urban congestion.

The third case study is set in Bologna, Emilia-Romagna capital city, with about 400,000 inhabitants (a typical EU metropolitan area’s core). Data collection revealed that 45,000 vehicles/day travel throughout Bologna LTZ, and actions for their reduction are needed.

In action

Subcase at the regional level. The Region has promoted and supported the implementation of a working group with the main regional municipalities to harmonise city’s access permits for urban deliveries into the LTZ. Together, Region and cities, have worked to define a prototyped solution for a region-wide web portal to standardize the procedure for users (e.g. logistic operators and hauler), with ‘front-end’ functions (such as a regional telematics gate). The prototype does not interfere with the technological structure of the municipalities (databases of the various local systems), but makes use of and communicate with them. This regional telematics portal proposes a single digital access point to verify the permit requirements, checking for active permissions and request for new permits, as well as modification or renewal of an active permit. The overall study has investigated on the state of the practice in term of Emilia-Romagna cities’ regulatory framework for freight deliveries in the city centre, derived a set of proposals for harmonised actions and eventually elaborated a feasibility study for the IT tool prototype.

In Reggio Emilia, the scope of the study was to support the Municipality understanding if an existing parking area can be used as an urban distribution centre (UDC) to deliver goods in the city center. A robust data analysis was performed to study the situation of goods deliveries in the city center, by involving shops in the analysis. Based on data analysis of interviews and business simulation models, the study has defined the theoretical functional design for distribution and collection schemes that can be adapted to the context of the localized UDC. In addition, with more detail, the work has defined the characteristics of the dedicated logistics infrastructure, the proposed organizational model, the operational plan for starting the project, the investment plan and the economic plan concerning a short/medium term temporal horizon.

The analysis carried out in Bologna has characterised the last-mile delivery systems, to compare them to existing practices for sustainable UFT and to evaluate potential impacts of the so-called hybrid model for shops (e-commerce and traditional trade). The matter is novel and challenging, and a
broad analysis is first required. This study investigated pros and cons and provided preliminary suggestions to the Municipality for further studies and concerted actions at the Municipal level to be carried out after NOVELOG. Also, this case study provides insights into the on-going preparation of the Bologna’s city SUMP.

**Results**

Through this case study, Emilia Romagna region and ITL collected information on permits’ rules into a Database giving a detailed overview by city, that is easy to update in the coming years. Also, this case study allowed for an ongoing stakeholders cooperation on the harmonisation rules and made an important breakthrough step to unify and digitalise the management of the permissions for LTZ at the regional level. The participation of the regional government, Lepida Spa (in-house Emilia-Romagna ICT infrastructure provider) and Municipalities was fundamental to guarantee long-lasting dialogue and commitment, beyond NOVELOG duration.

In Reggio Emilia, the proposed solution synergistically works with a foreseen significant reduction in commercial traffic envisaged by further traffic limitation and pedestrianization of a certain area of the city centre. As a consequence, the improvement of environmental (atmospheric, acoustic, visual) impacts, which, overall, would have the effect of improving the image and attractiveness of the area, can lead to clear benefits for the local economic and commercial activities, in terms of market value and turnover. The study has also produced a customisable excel based tool serving the dimensioning of the fleets for goods deliveries connecting the parking area and the city centre.

The study carried out in the Bologna area, on the one hand, seems to show positive results of introducing e-commerce in traditional shops and promoting home deliveries solutions. On the other hand, it is clear that, at present, companies seem to prefer the relationship with the consumer rather than the fulfilment processes. As a consequence, hybrid model penetration is not expected in the short-term and companies are awaiting (or are studying) some qualifying elements, such as technology, which reduces the risk of investment in this new channel.

### Impact Assessment results

<table>
<thead>
<tr>
<th></th>
<th>Traffic throughput</th>
<th>Customer satisfaction</th>
<th>Punctuality</th>
<th>Load factor</th>
<th>Service quality</th>
<th>CO2</th>
<th>Noise</th>
</tr>
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<tbody>
<tr>
<td><strong>Baseline</strong></td>
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<td></td>
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</tr>
<tr>
<td><strong>Result</strong></td>
<td>21% decrease</td>
<td>50% increase</td>
<td>16% increase</td>
<td>56% increase</td>
<td>1% increase</td>
<td>31% decrease</td>
<td>0.04% decrease</td>
</tr>
</tbody>
</table>

Challenges, opportunities and transferability

Across the main cities in the Emilia-Romagna region, LTZ access’ enforcement systems are numerous and heterogeneous. Consequently, permit management systems present a similar degree of heterogeneity. In particular, smaller municipalities may find difficulties in providing advanced services (e.g. online) as investments in technology are by its nature more limited. A high-level (region-wide) action plan would therefore ensure the same quality of services for all citizens and improve the effectiveness of control actions for all public administrations. To undertake a progressive harmonization and a single one-stop-shop on line service on a regional basis, the aspects of “dematerialization” were identified, to work to achieve complete uniformity across all municipalities. Indeed, some municipalities currently allow the electronic transmission of documents and release the permit in dematerialized form (the permit does not consist of any physical support, but is an authorization linked to the user / vehicle). However, this practice is not homogeneously diffused across such municipalities. To complete this process, technological upgrades are sometimes necessary (in particular on parking enforcement). Benefits can therefore be obtained, both for the public administration and for the citizens. The results of the discussions held in various meetings of the
working group among the Emilia Romagna Region and the Municipalities have shown a strong complexity, in particular from the procedural point of view. At the same time, the harmonization of the tools to access these services is advisable. This case study presents several elements transferable in other EU contexts: data analysis, stakeholder cooperation and involvement process, example of prototype for IT solution among all. It functions as one of the topics for SULP preparation in the cities of the Region.

In Reggio Emilia to achieve these goals, however, it is fundamental that the operators of the sector (e.g. freight forwarders, couriers, wholesalers, etc.) join this challenge and necessarily have a direct benefit deriving from the evolution of their distribution process and/or supply to the proposed innovative model. For the launch of the service, it is essential to define the governance model to be adopted for the future coordinated actor managing the UDC, ensuring a proper start-up, operational development and neutrality of the service, also respecting everyone’s needs. In a short/medium-term view, the best way to promote the launch of the service is to create a subsidiary company, characterised by a different distribution of shareholdings and including the public owner/operator of the “ex-gasometro” parking area and the current fleet of electric vehicles.

In Bologna, the main outcome of the study is that small retailers do not have the sufficient vision for implementing such a strong collaborative effort and need to be trained and supported. All stakeholders agree on the strategy to avoid concentration of freight vehicles in the city centre (bringing more congestion and decreasing commercial attractiveness) and are willing to consider how to divert goods outside, by implementing delivery services from warehouses directly to customers’ homes. The study has identified a series of medium/long-term actions necessary to further study the phenomenon, explained in the following:

- to map the current dynamics of freight distribution, with particular reference to e-commerce, verifying their flows and comparing them with the situation before the advent of this sales model;
- to activate working groups together with retailers’ association, organizing training sessions on the hybrid sales model and the possibility to engage collaborative networks based for example on loyalty programs;
- to set-up co-ordinated marketing and collaborative logistics;
- following the results of the analysis of the freight distribution dynamics, to implement measures aimed at controlling the goods flows, possibly on a wider area respect the historical center only, and rely on the rewarding factors to be activated for high load factors and certified route reductions.

### Impact Assessment results

<table>
<thead>
<tr>
<th>Category</th>
<th>Impact</th>
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<tbody>
<tr>
<td>CO2</td>
<td>12% decrease</td>
</tr>
<tr>
<td>Traffic throughput</td>
<td>12% decrease</td>
</tr>
<tr>
<td>Noise</td>
<td>0.04% decrease</td>
</tr>
<tr>
<td>Punctuality</td>
<td>7% increase</td>
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not favourable ↔ favourable
In brief
The Gothenburg case has focused on the development of a consolidation service for deliveries of goods to the large shopping centre Nordstan, located in the city centre of Gothenburg. The service is established at a location outside the central city, in cooperation with a logistics operator at an existing terminal facility. The main aim is the consolidation of small shipments, which generates the most traffic volumes in relation to the goods volumes. The analysis focused on: a) the establishment of a Consolidation Centre (used as “c/o address”) for deliveries to serve the Nordstan shopping centre; b) the definition of a regulatory and incentivizing scheme for the promotion of Consolidation Centres and ultra-low emission vehicles for last mile deliveries.

Context
Gothenburg has been working on the development of a legal framework for sustainable city logistics in the inner city for ten years. Consolidation of smaller shipments is regarded to have a big potential for reducing distribution traffic in the central parts of the city, which leads to less congestion, noise and pollution, as well as it will contribute to a more pleasant and attractive city environment. Gothenburg has earlier developed concepts based on the establishments of independent “micro terminals” (such as Stadsleveransen and Lindholmsleveransen) where a neutral “third party” is the link between the transport companies and the goods receivers. Some streets in the city centre have already been regulated, such as walking speed areas and pedestrian zones, and the city is working continuously with different measures to reduce the traffic from cars and heavy trucks. The roads surrounding Nordstan are saturated during large parts of the day, and a reduced number of freight vehicles entering the area will make an important contribution to both less pollution as well as less congestion.

In action
The activity planning was carried out by the Urban Transport Administration of the City of Gothenburg and the five real estate owners that own Nordstan. During the preliminary study, the University of Gothenburg and logistics operators Schenker, PostNord and DHL provided support to collect and analyse freight data, in coordination with the major transport companies operating in the Gothenburg area and Nordstan’s business owners. The data collection and analysis revealed that only a few of the companies delivering goods to Nordstan perform most deliveries. Moreover, smaller shipments make up a substantial part of the traffic volumes, and a quite small share of the deliveries consists of time-controlled shipments. This confirmed the suitability of a consolidation service as a solution to improve the traffic situation in the city centre. In the second phase, the stakeholders agreed on the creation of the consolidation centre to be located at a suitable facility outside of the central parts of the city. The consolidation point will receive smaller shipments from approximately 60 companies out of the total number of 200 businesses in Nordstan, in a first pilot phase (assumed to be gradually scaled up further in 2019). The service is presumed to be integrated into a large existing terminal facility. The last mile delivery is provided by the contracted logistics company, with approximately 2-3 delivery trips per day. The businesses connected to the service will
assign the consolidation terminal as delivery address (c/o address), except for some specific types of goods that have been excluded in the first phase (perishables, express, very high value, etc.). All shipments are registered into a universal ITS track & trace system, providing the customers with real-time information of the status of their deliveries. The last mile delivery is performed according to the established base service level (delivery to door), with eventual value-added services (delivery into the shop, unpacking, removing wrapping, etc.) as agreed with the businesses respectively.

Results
Calculations and simulations have been performed for the case of consolidating the “regular” goods flows (non-perishable, express, high value etc.). The calculated impacts include a 38.89% CO2 emissions reduction and a 50%-decrease of vehicles entering the Nordstan shopping centre (from 600 to 300 vehicles per day). Since many of the relevant stakeholders are business owners, a significant result of the project is the fact that the solution provided by the consolidation centre is commercially sustainable. Another relevant result is the increase in the knowledge of goods flows in central Gothenburg, as shown by the data analysis carried out in the first part of the case study. Moreover, the work within the city to encourage future sustainable and efficient solutions for city logistics has been further strengthened - in line with the previous Stadsleveransen and Lindholmsleveransen projects.

Challenges, opportunities and transferability
The case looks very promising regarding the potential identified through the analysis of reliable data and the engagement from the involved stakeholders, crucial for the development and implementation of a UCC. Extensive work with freight data has led to a very useful database regarding the characteristics of the supplies to both Nordstan and similar areas. The measure is considered to have a very high potential for transferability to other similar cases, and the upcoming pilot is assumed to pave the way for a new niche of consolidation services within the logistics sector. The complexity of different potential scenarios is, however, varying to a large extent, and the solution in the Nordstan case may need to be elaborated substantially to be feasible in a case with many more affected stakeholders, or different compositions of businesses.

<table>
<thead>
<tr>
<th>Impact Assessment results</th>
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<tbody>
<tr>
<td><strong>CO2</strong></td>
</tr>
<tr>
<td>39% decrease</td>
</tr>
<tr>
<td><strong>Average driving distance</strong></td>
</tr>
<tr>
<td>97% decrease</td>
</tr>
<tr>
<td><strong>Load factor</strong></td>
</tr>
<tr>
<td>60% increase</td>
</tr>
<tr>
<td><strong>Vehicle utilization factor</strong></td>
</tr>
<tr>
<td>(in hours)</td>
</tr>
<tr>
<td>14% increase</td>
</tr>
<tr>
<td>not favourable</td>
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<tr>
<td>favourable</td>
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</table>
The focus of this pilot is the mitigation of freight traffic in the city center. Concrete action regards the extension of the delivery service “bring mE” – performed by cargo bikes – to more shops, and the inclusion of a B2B service for some shops.

The focus of this case study is to study:

(i) the introduction of a planned hub (consolidation centre), for distributing goods to the shops in the city centre (B2B, delivery and return of goods);

(ii) the impacts of the implementation of a micro hub (mostly B2B) together with the use of locker systems for residents (B2C). This is part of the newly mixed usage Smart City districts (including housing areas) that the City of Graz is implementing in partnership with private investors.

At the beginning of the NOVELOG project in 2015, no data were available concerning the situation of UFT in Graz. Therefore, the project began with conducting an observation and inquiry of the delivery of goods in the pedestrian zone. In combination with the modal share of traffic modes (private motorized vehicles, bikes, public transport, and pedestrians), the results were evaluated for a possible implementation of a pilot operation (delivery service) and for an estimation of the future situation in the new Smart City housing areas. The result helped to understand the present situation, get to know the requirements and needs of the shops and plan solutions for the new housing areas. Also, a benchmark of the best practices in other countries helped with planning and preparing the measures. Concerning the planned hub,
the private companies GLS and Fuhrwerk (the operator of the delivery service “bring mE”) performed a test with a mobile hub. A local stakeholder platform was set up, and stakeholders were contacted and invited to the meetings.

### Results

The implementation of the pilot and the case studies have provided more knowledge of the freight deliveries into the city centre and improved the collaboration among the city administration, shop owners and logistics operators.

In the pilot project phase, the major difficulty was to convince the shop owners about the advantages of the service for all shops in the city centre. The use of the “bring mE” delivery service unfortunately did not increase.

The case studies supported a positive position within the municipality to introduce ‘hub’ solutions to serve the city centre and a locker system for the new Smart City housing areas. Final decisions about the business models of both solutions are now under evaluation by the city and private stakeholders.

### Challenges, opportunities and transferability

The challenge is to further convince shop owners within the city centre and expand the B2B service; using the calculated impacts, Graz could quantify the positive effects to the current situation. The urban delivery service concept “bring mE” can overall be assessed as positive and practicable, and other cities can quickly learn about its pros and cons. Because of its business model and the software used for this service, it is easily replicable in other European cities, with minor adaptations regarding local requirements and framework conditions. Regarding the implementation of ‘hub’ solutions for freight consolidation/transhipment, the case study was the basis for Graz to start the detailed planning of an implementation phase. The implementation of a locker system will be tested beyond NOVELOG, and in case of success, the solution will be replicated all over the city.

<table>
<thead>
<tr>
<th>Impact Assessment results</th>
<th>100% decrease</th>
<th>10% decrease</th>
<th>100% decrease</th>
<th>363% increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed and pedestrian zone violations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorized traffic throughout</td>
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<tr>
<td>Vehicle’s service &amp; idle time</td>
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Not favourable | favourable
In brief
The London Case Study deals with the development of an area-wide Freight Plan focused on Barking Riverside. The Freight Plan’s main objective is to mitigate the impact of commercial freight traffic in the area and to tackle a range of localised congestion, safety and environmental issues.

Context
Barking Riverside is one of the largest development sites in London and is the largest housing development in the Thames Gateway. Over the next 20 years, 10,800 new homes will be built to house 26,000 people, with a range of supporting infrastructure and facilities also planned. In addition, the area has a long-established residential community-based in the Thames View and Great Fleet estates and is also home to a diverse range of industrial and commercial activities, ranging from local retailers and manufacturers to major multinational companies. The low compatibility of such competing land uses and operational activities leads to a conflict in terms of local transport priorities. The area suffers from an overburdened local road network and poor local air quality. In addition, the significant presence of Heavy Goods Vehicles (HGVs) is of particular concern for the safe movement of pupils attending local schools.

In action
The London Borough of Barking and Dagenham worked in close cooperation with research and logistics operators, retailers, business stakeholders and citizens. The implementation was organized in three different stages. The first stage of the development of the Freight Plan (December 2015 – August 2016) involved the collection of comprehensive, up-to-date data on the extent of the various traffic problems in the area (e.g. traffic volumes/movements, collisions, etc.). Further information on the operational activities of local businesses (e.g. nature of the business, size of the vehicle fleet, journey patterns, etc.) was also gathered.

The second stage (April-August 2016) consisted of the development of a delivery plan outlining a range of sustainable freight interventions that could be implemented across the area. In addition, businesses willing to pilot specific measures and initiatives were identified.

The third stage (October 2016 – ongoing) involved the roll-out and monitoring of freight plan measures aimed to maximise the coordination and efficiency of business logistics operations, and to reduce the impact of freight traffic in the project area. The actions were based on a four-pronged approach of engagement, improvement, enforcement and innovation. These actions included the establishment of a Freight Quality Partnership (FQP) to bring together
local businesses and stakeholders to tackle local freight issues; the implementation of Company Delivery and Servicing Plans (DSPs); improvements and upgrades to the street infrastructure; a more visible and sustained enforcement to help reduce the extent of parking problems; the development of an in-vehicle technology which fleet operators tested to reduce air pollution.

Results

As a result of the NOVELOG pilot in Barking and Dagenham, a range of measures to take forward was identified, such as significant improvements to signage and parking enforcement.

However, the Freight Plan has not been successful in its entirety due to a lack of interest and engagement of businesses and freight operators. Therefore, some of the measures foreseen by the Plan were not implemented. It has not been possible to determine whether the Freight Plan is a useful planning tool to mitigate the effects of freight activities. Whilst the measures proposed in the case study freight plan were assessed as appropriate for tackling the various issues facing the Council and businesses and freight operators in Barking Riverside, it has not been possible to measure their effectiveness.

Challenges, opportunities and transferability

The most important lesson learnt from the implementation of the case study is that the effective participation of key stakeholders is critical to the success of the Freight Plan. For this reason, more time and economic resources should be dedicated to improving the quality of the stakeholder engagement phase. Moreover, the different priorities and goals of stakeholders should also be coordinated to ensure the success of the Freight Plan.

Assessment of similar measures employed elsewhere - particularly as a package of measures, suggests that improvements to issues such as congestion, air quality and safety can be achieved thanks to measures such as eco-driving, a better journey planning and the development of DSP. With regards to the transferability of the project, there is no ‘one size fits all’ approach to the development and delivery of freight plans. The number and scope of measures proposed in a plan can vary depending on the nature of the area covered by the plan and the range of issues faced in that area, as well as the overarching objectives and priorities of the key stakeholders - government bodies, local businesses and freight operators.

<table>
<thead>
<tr>
<th>Impact Assessment results</th>
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<tbody>
<tr>
<td>PM$_{10}$ 7% decrease</td>
</tr>
<tr>
<td>Traffic throughput 3% decrease</td>
</tr>
<tr>
<td>NO$_2$ 7.5% decrease</td>
</tr>
<tr>
<td>No of Accidents 5% decrease</td>
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not favourable[999] favourable
In brief

The implementation of the NOVELOG project in Mechelen involves two pilot actions. The first one is the development of an urban distribution centre to operate bike services for last-mile deliveries. The second one is the development of a parcel lockers system for pickups and deliveries in the inner city. Close cooperation between the City of Mechelen, logistic service providers, and business stakeholders has been crucial to achieving the success of both pilot actions.

Context

The city of Mechelen has a population of about 85,000 people with high urban related business activity (over 55,000 commercial m² and almost 1,000 shops). Even though a traffic restricted zone has been created in the city centre, the transport distribution is mainly operated by vans and trucks. Quality of life in high-density areas and in the historic centre is threatened by high traffic congestion, noise and air pollution. Hence, the overall goal of the Mechelen city is to expand the traffic restricted zone and promote measures for efficient urban logistics. The establishment of parcel lockers for the pick-up and delivery of goods and the development of an urban distribution centre were part of this effort. The main mobility and environmental objectives include a reduction in the traffic flows in the inner city, and a reduction in the CO2 emissions due to urban freight transport, and an increase in the reliability of the deliveries.

In action

The purpose of the urban distribution centre is to introduce a last-mile freight solution in the city centre, specifically in the extension of the car-free zone (LTZ). A bike courier was designated for urban freight distribution in the city centre, and traditional couriers were asked to lean on it for their last mile in the city centre. A survey was conducted to collect information regarding the freight flows to identify opportunities for the set-up and implementation of the urban consolidation centre. However, this survey did not provide significant results and a complementary survey was applied to collect information from Logistics Service Providers (LSPs). Despite the effort of the public authority, LSPs were sceptical of participating. Personal meetings were arranged with logistics operators GLS, DPD and UPS to discuss initiatives for cooperation regarding the last-mile pilot action.

The development of lockers for pickups and deliveries in the inner city was aimed at improving freight distribution of e-commerce deliveries. Originally, four different locations in Mechelen were chosen for installing BringMe lockers: a car park outside the city centre, two underground car parks in the city centre and a location close to the main square, where each Saturday the market takes place. The installation of lockers proved to be very demanding due to the necessary technical requirements concerning their connectivity (i.e. COAX cable and Wi-Fi). For budget reasons, only two lockers were installed and they were tested for 6 months instead of one year. The lockers were officially launched on 2 August 2017.

Results

Indicators covering the areas of “mobility” and “environment” were used to assess the
impact of the pilot actions, reflecting the city’s main objectives. For what concerns mobility, the traffic throughput was measured by the number of motorised vehicles and the kilometres driven. The impact of the pilot actions was positive: the traffic throughput dropped by 30% (from 180 vehicles-km to 126 vehicles-km), which is 15% above the initial expectations. The pilot did not produce such positive results on the vehicle utilisation factor, measured as the time taken for a vehicle to deliver the products: indeed, no time gain was reported when delivering with cargo bikes. From an environmental perspective, total CO2 emissions were reduced by approximately 30% due to the shift to cargo bikes, which is a zero-emission transport mode.

Furthermore, following the NOVELOG project, the City of Mechelen has decided to use cargo bikes to deliver goods to two departments of the Municipality, ‘Office Supplies’ and ‘Marketing & communication’. The main objective is to support the implementation of energy efficient measures aiming to decrease the corresponding traffic flows and CO2 emissions within the inner city. ECOkoeriers - the operator selected to provide this service - is currently implementing the last mile deliveries by picking up the goods delivered by suppliers to a depot outside of the city centre. However, an issue appeared regarding the delivery cost for the city as the suppliers and ECOkoeriers do not cooperate on transport operations. The delivery cost remains the same while the city has to pay an extra fee for the last-mile bike delivery. This proves the importance of collaboration among different stakeholders. Significant benefits could be achieved by developing mutual engagements that could also contribute to the reduction of social costs related to environmental pollution, energy consumption and traffic congestion. Nevertheless, the demonstration was enlarged to all city services. The bike courier now performs the last mile for all the city services. It is important as city administration to lead by example.

**Challenges, opportunities and transferability**

Many lessons were learned thanks to the NOVELOG experience. First and foremost, the cooperation between public and private stakeholders proved to be an important element to deliver innovative city logistics solutions. Furthermore, synergies within the logistics sector are essential for both first and last mile distribution activities. The pilot has highlighted the importance of aligning the city’s regulatory framework to support effective measures for urban freight distribution. Finally, the measures implemented within the NOVELOG project in Mechelen are transferable only if special attention is given to their specific technical issues and requirements, which may be different in other city contexts.
In brief

The pilot has monitored and managed the access of freight vehicles within the city, recognizing the types of vehicles entering through innovative technologies, as flow sensor wireless-based to enhance the data information coming from RFID Gates. During the pilot, a mobile app has been developed and tests have been performed to send alert information via mobile to freight carriers to communicate the availability of loading/unloading (L/U) areas in the city centre, and to inform the local police for parking time violation. The main goal is to encourage the use of electric vehicles within the Limited Traffic Zone (LTZ) for local exchange carriers, to decrease the CO2 emissions within urban areas.

Context

Pisa is a historic Italian city with about 200,000 inhabitants. The city significantly lacks data on UFT phenomena and it shares with other EU cities significant congestion problems, which are snapshotted by the average load factor of freight vehicles about 35%.

Partly as a legacy of its past, Pisa performs functions that have a regional, national and even global perspective. It shows global excellence in science and technology, with its three Universities, hosting around 60,000 new students per year; it hosts cultural sites attracting tourists from all over the world; the Leaning Tower is undoubtedly one of the most famous tourist attraction in the world. It functions as a national hub for rail and air transport: the airport, with over 4 Million passengers per year, is the largest in Tuscany and one of the most important in Italy; the rail station sees over 15m passengers per year, and it is placed at the crossroad between the central and the coastal axis of the Italian rail network.

The monitored area for this intervention is the entire boundary of the city through the main access/exit roads. For specific actions, as the monitoring of reserved parking areas for freight vehicles, the area is the LTZ.

In action

The city has a strong demand for sustainable initiatives due to congestion in the urban area and the historic centre, and it presents several criticalities. The lack of knowledge of number and concurrent access of urban freight could be resolved through the integration of new technologies (for traffic counting and classification) and the actual instruments already available (e.g. RFID gates and passes). The lack of reserved parking slot availability in the centre of the city could be solved by increasing the reserved slots for freight vehicles, information about their availability, and the Electric Vehicles VAN Sharing scheme.

Besides, in the city there are no tools and policies to control freight vehicles outside the LTZ but inside the city; in this case, it has started a plan to install parking sensors for freight vehicles, in order to provide the availability of these parking slots.

The project has monitored the access of freight vehicles within the city, through methodologies, measurement and control tools that helped understand urban traffic due to freight carriers, the availability of the L/U bays reserved for them, and the incentive to use of electric vehicles.
vehicles in the LTZ area. The pilot implemented very useful innovations. It mapped the population of carriers, through the widespread distribution of permits passes with RFID TAGS. It monitored and managed the access of freight vehicles within the city, recognizing the types of vehicles entering through innovative technologies, as wireless-based flow sensors, and data information coming from RFID Gates. Alert information is sent via mobile app to freight carriers, such as the availability of L/U bays in the city centre, and to inform the local police for parking time violation.

Results

The utilization of the app allowed to: track the freight vehicles; guide them to the available parking spots reserved to this activity; verify the check-in check-out of freight vehicles over the reserved parking spots. In terms of planning and integration of measures at SUMP/SULP level, the pilot action allowed the city to understand the process, the dynamic of stakeholders involvement, the needs, the propensity to collaborate by sharing data and participate to the decision-making process at the local level. The process is quite slow due to the presence of small operators working for big companies at the national level, so their direct involvement in local policies and incentives is difficult and requires energies and, above all, some time to change behaviour. The mobile app and the technological tool allow to push and force a process, which could be implemented in a medium time with new and more services, data and functions for the final users.

Challenges, opportunities and transferability

The analysis could be useful to set economic incentives to facilitate the main transport, the decongestion of traffic, reducing timing of parking in the LTZ areas. The SUMP of the city is in progress. However, the strategic political agenda for 2030 aims to innovate and achieve a more efficient urban freight logistics system. The first decisive step for the administration is to set a specific regulatory framework, that will guarantee the involvement of local stakeholders, and that will set a rewarding scheme to support behaviour change and promote the new measures for the access and the parking in the urban area and the city centre. From a technological point of view, the priority is the development of a real-time freight tracking management system. This will guarantee inter-modality (train, road, ferry), to exploit the specific assets of the territory, logistic connections, and position at the regional level. The inland waterway circuit also needs to be enhanced and promoted both for freight and passenger transport.
In brief
The pilot in Rome concerns the design and development of a Decision Support System (DSS) for freight distribution planning and monitoring. A DSS is an information system able to elaborate analysis on data oriented to strategic decision making. In the field of city logistics, a DSS can support the public decision makers to understand the effects of city logistics measures, and the private operators to evaluate the financial viability of them. The DSS can be considered an IT-based solution to support planning of city logistics measures to achieve the objectives set by the Municipality.

In action
The pilot project used data made available by the involved stakeholders. These data included elaborations concerning supply chains affecting the area, demand, offer, impacts, performances of freight electric vehicles, the business plan of an urban consolidation centre. On the basis of the information gathered, the pilot partners CTL (university) and RSM (Rome mobility agency) designed the DSS for freight distribution planning and monitoring, and validated it through an application concerning the (in the historic centre) of Rome. The DSS consists of a three layers system composed of data, analysis and evaluation. The DSS takes as input data coming from surveys and other databases, elaborates them according to transport models and operates the ex-ante evaluation of results. The DSS can elaborate, for example, traffic flows assigned to the road network, environmental pollutions, noise, congestion, as long as economic and financial analysis of how a city logistics measure represents a business opportunity. The evaluation is made based on key performance indicators measured and weighted through the available data and the cooperation of stakeholders.

Context
The capital city of Rome extends over 1,285 sqm with 2,873,000 city residents and 1,200,000 employees. Circulating vehicles in Rome reach 2,650,000. Around 160,000 vehicles are dedicated to urban freight transport. The daily citizens’ mobility amounts to 4.7 million trips, 570,000 in the peak hour. Rome is a historical and cultural heritage city, with a rigid road network made of narrow streets. Each year more than 23 million tourists visit the city. Intense private traffic and related network congestion are causing high air pollution levels. Freight distribution is supported by a system of rules and incentives implemented by Rome Municipality. These include access rules (freight LTZ), weight and dimension restriction for trucks to enter the LTZ, time windows, permission fee, incentives for purchasing green vehicles.

Rome aims at reducing the overall impact of urban freight transport (congestion, emissions) but at the same time guaranteeing the efficiency of freight distribution. For this reason, the municipality realised surveys (1999, 2008, 2012) and it is testing of innovative solutions (e.g. regulation framework, electric vehicles for freight distribution, urban consolidation centres).
Results

The pilot of freight DSS consisted of a simulation of city logistics scenarios elaborated on the basis of the current regulatory framework in Rome, and specifically in the ‘Tridente’ Area. The scenarios concerned the introduction of an Urban Consolidation Centre (UCC) and the use of electric freight vehicles for the last-mile delivery from the UCC. The commodities addressed by the UCC belong to the Ho.Re.Ca. supply chain. The simulation elaborated the data available concerning traffic volumes, demand, freight O/D matrices, vehicle performances, characteristics of deliveries, as long as current infrastructure. The models inside the DSS allowed performing a transport analysis to calculate impacts (environmental, energetic) and a business analysis to calculate costs and revenues of the UCC. The joint results have been evaluated together with stakeholders and included in the calculation of the Logistics Sustainability Index (LSI), a summary indicator of the whole performances. The dimensions of the LSI considered are Economy and Energy, Environment, Transport and Mobility, Society, Policy and Measure maturity, Social acceptance, Economy and Energy. The LSI compares a ‘before’ situation (current status) with an ‘after’ situation (best performing scenario).

The LSI states that the ‘after’ situation is better performing as a whole compared with the ‘before’ situation. This means that all the different perspectives of the evaluation are satisfied for the different perspectives of the stakeholders, thus the potential acceptance of the solutions is optimal.

The simulation conducted reveals the validity of the DSS implemented. In addition, RSM and CTL also studied how to integrated the DSS in the current systems owned and operated by RSM.

Challenges, opportunities and transferability

The DSS is a tool to support the goals outlined in the new SUMP, under preparation, regarding freight distribution issue. The Local Authority will implement a set of measures, already described in the Urban Traffic Master Plan approved in 2015, to reduce negative impacts of freight vehicles. These are the enlargement of the freight LTZ; a new booking service to optimize parking areas; timetable and pricing policy evaluation, based on vehicle models and commodities; van-sharing policy promotion; the increase of the vehicles load capacity and reducing unloaded trips, through new transit points; the revision and update of the loading/unloading freight plan in the city centre.

Impact Assessment results

<table>
<thead>
<tr>
<th>Emissions: CO2, NOx, N2O, SO2, PM</th>
<th>100% decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>100% decrease</td>
</tr>
<tr>
<td>Accidents</td>
<td>7% decrease</td>
</tr>
<tr>
<td>Injuries</td>
<td>14% decrease</td>
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not favourable | favourable
In brief

Thanks to NOVELOG, the City of Turin has designed and has been already running since June 2016 a soft, ‘pull’ measure dedicated to stimulating the replacement of highly polluting vehicles. New measures are tested to share existing infrastructures dedicated to public transport also with goods delivery, considering freight transport as a public service. New permission schemes encourage logistics operators available to replace their vehicles with a clean one, equipped with an on-board ITS system.

Context

The city of Turin is one of Italy’s most prominent cultural and commercial centres, attracting large numbers of people and goods. The city spreads for 13,001 Km² and has a population of around 900,000. Big real estate areas are located within Turin’s industrial zone thus increasing the volume of inbound and outbound goods flows. The motorization rate is about 63% with the following modal split: 53% private car, 19% public transport, 28% other (pedestrian, taxi, bike, etc.).

A Limited Traffic Zone (LTZ) has been introduced in the city centre, covering an area of 2.62 km² characterised by high environmental and cultural value. Around 52,000 residents live in LTZ with a density of approximately 12,600-inhabitants/km² which is twice city average. Before the NOVELOG pilot, there was in place no specific regulation for goods delivery in the LTZ; even Euro1 gasoline/diesel powered commercial vehicles could access from 7:30 am to 10:30 AM. The common understanding about the need to reduce commercial vehicles’ harmful emissions, along with the acknowledgment that no specific funding was available to foster polluting vehicles replacement, represented the starting point in the development of a new governance model.

The Municipality of Turin aims to reduce freight-related congestion and polluting emissions in the LTZ without penalizing social and economic activities within the city centre. The city initiated a collaborative approach with stakeholders to improve city logistics already during the PUMAS project. The participation in the NOVELOG Project represents the opportunity to continue the experimentation and identify innovative solutions. Turin’s innovative approach is based on the principle of inclusion rather than exclusion, as stated in the Freight Quality Partnership (FQP) scheme.

In action

The measure developed within NOVELOG introduces administrative and regulatory schemes and incentives, and it is fully integrated into the overall City environmental strategy and transport policies. The innovative governance model developed in the city of Turin relies on a proactive and effective stakeholders’ cooperation for achieving a resilient urban development.

To compensate the replacement of the polluting vehicles, a mix of incentives has been
implemented in the access permission scheme: free access to the LTZ without restrictions for two years, dedicated and reserved parking lots, and the possibility to use multi-users lanes along with buses, thanks to an agreement signed by the freight operators and the Municipality. There are some conditions for logistics operators to obtain such incentives. Their goods must be delivered within the LTZ. Their vehicles have to be Euro 5 standard, CNG-fuelled or electric, and the maximum loaded mass that they can carry must not exceed 3.5 tons. Furthermore, all vehicles have to be equipped with GPS systems able to provide real-time vehicle data (e.g. location of the vehicle, tracking and tracing, etc) to a control centre.

To collect and analyse data, dedicated questionnaires have been delivered to different categories of stakeholders during the NOVELOG Turin Pilot. For what concerns information on vehicles and trips, data have been collected directly from the GPS on-board units of the vehicles and related commercial platforms for vehicle monitoring. Data from the express carriers have been integrated with the number of fees, number of accidents, and operators’ satisfaction.

**Results**

The NOVELOG pilot allows the Municipality to constantly measure and report the sample vehicles fleet flows to control authorized access for delivery vehicles in LTZ by mean of standard market ITS products. Furthermore, the assessment of the pilot’s impact in Turin was made possible by a specific evaluation tool called “ABM-TO” model. This agent-based model provides an empirical simulation of urban freight transport in the Turin LTZ, in which the NOVELOG permit is applied. In particular, ABM-TO simulates the retailers’ behaviour, modelling the mechanisms that have a stronger influence on their decisions about eco-friendly or non-eco-friendly behaviour for goods supply. The final aim is to evaluate the effects of NOVELOG-based policies in fostering more eco-friendly behaviour of retailers. The results suggest that a policy oriented to provide rewarding incentives for a shift from own-account to third-party freight transportation produces good results in terms of less time needed for the adoption of eco-friendly behaviour. This policy seems more effective with respect to a monetary incentive for the purchase of a green vehicle in the own-account option. A low difference is observed in terms of results between the implementation of a light or strong incentive for vehicle change.

**Challenges, opportunities and transferability**

The Turin pilot has shown that logistics operators are very comfortable with the new policy measures introduced. In general, they agree to replace their freight vehicles in favour of new and more eco-friendly ones in exchange for more flexibility in the use of bus lanes and access the LTZ. The experience of Torino in the NOVELOG project is considered a best practice in the Italian panorama in the field of sustainable city logistics. To reproduce this initiative in a different context, the most important aspect to consider is that a permanent dialogue between operators, associations and public authorities is essential.
In brief

Despite representing a distinctive feature of urban planning, islands face a tremendous lack of accessibility, depopulation, social cohesion and they turn out to be poorly connected. The case study addresses – among various policy priorities - the issue of promoting better connections to remote urban areas (islands) via effective and highly innovative business models. The case study encourages the use of a single integrated urban transport network considering two dimensions: the ‘horizontal’ (geographic) integration between the core and peripheral urban areas (historical centre and islands); the ‘vertical’ integration between two urban mobility systems, that is, freight and passengers.

In action

Preliminary activity has regarded data analysis according to an effective logistics planning (scenario-building) approach consisting of the following steps. 1) Initial scenario building: the ‘as is’ scenario (mapping and replicating the existing urban logistics network and configuration); 2) Critical issues and opportunities for innovative policy actions and business models (cargo hitching); 3) Second scenario building: the ‘to be’ scenario (simulating and testing innovative solutions).

At a strategic level, a new urban logistics network design is proposed. It is based on an optimised logistics network improving accessibility to the islands and the overall environmental system. At an operational level, the cargo hitching concept is employed in simulations to create the connection with the islands, in optimising the existing network. Parallel to on-the-field surveys and data collection activities, some stakeholder involvement events have been organized to discuss specific issues and validated collected data.

Data collection analysis is expected to become more reliable. This has to be seen as exceptional added-value information generated by the NOVELOG activities. An extensive on-the-field survey has been carried out in each relevant logistics node of Venice. It focused on the following logistics parameters: overall daily freight operations (urban quantities in/out of the urban context); scheduling and hourly distribution of logistics activities; types of products; load factor; circulating boats; urban market shares of own account transport and third-party providers.

The state of the art of urban logistics networks for passenger and freight was then simulated.
by analysing existing UFT flows and public transport system in the research area. The simulation of public transport network enables the cargo hitching concept. Estimated transport volumes are then used to get the consequent number of freight boats to be operated.

**Results**

This unique analysis in the city of Venice has been made possible thanks to the strong cooperation with the logistics operators and associations. The research focused on the Northern area of the Venice Lagoon, where a significant proportion of UFT demand and public transport routes (co)exist. The historical centre of Venice is the primary hub for freight transport, while the islands of Murano, Burano, Torcello and S. Erasmo are the main centres for freight transport.

To build the optimized urban logistics network, the study assessed the feasibility of cargo hitching solutions on the identified sections of the Lagoon. Cargo hitching has the capacity to create new urban logistics services in the Venice Lagoon.

Final results show that the freight transport demand can be accommodated by the existing spare capacity, via the new cargo hitching service, thus demonstrating the feasibility of the proposed cargo hitching service in the pilot area.

**Challenges, opportunities and transferability**

The overall objective of the Venice case study is to develop a DSS (Decision Support System) approach supporting innovative SUMP policy actions with regards to island connections.

Cargo hitching fosters the integration of both passenger and freight transport in an integrated SUMP. This is a new approach to SUMP and SULPs, since traditionally the two systems are independent. The bottom-line idea is to promote sustainability at urban level by exploiting innovative business models and planning approaches capable of thoroughly exploiting the existing transport capacity by unlocking opportunities of efficiency recovery.

The study identified two specific urban structures in which cargo hitching could be particularly suitable and effective, namely: (i) Urban structures characterized by significant urban sprawl: an urban centre and a large number of distant “satellites”, where distances are meaningfully considered in terms of travel times. In this respect, cargo hitching is an effective transport solution and a suitable business model capable of optimizing core-periphery connections (“weak” arcs) in an economically viable manner within an extended/distributed urban network. Cargo hitching is also scalable at metropolitan or regional levels; (ii) Strong touristic nature of the urban context along with significant environmental sensitivity. The following urban structures can be envisaged: satellite city (in Venice, each island with its own “green belt”); new towns; metropolitan areas; garden city.

<table>
<thead>
<tr>
<th>Impact Assessment results</th>
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<tbody>
<tr>
<td><strong>CO2</strong></td>
</tr>
<tr>
<td>15% decrease</td>
</tr>
<tr>
<td><strong>Load factor</strong></td>
</tr>
<tr>
<td>63% increase</td>
</tr>
<tr>
<td><strong>Vehicle utilization factor</strong></td>
</tr>
<tr>
<td>18% decrease</td>
</tr>
<tr>
<td><strong>Total number of deliveries per week</strong></td>
</tr>
<tr>
<td>133% increase</td>
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NOVELOG consortium

The NOVELOG consortium comprises a variety of experts in the field of urban freight transport, ensuring the knowledge of the academic sector, the experience of cities, the expertise of consultants and the multiplier effect of European networks.

For further information

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