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Facilitating the selection of city logistics measures through a concrete measures package: A generic approach

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Abstract

Urban areas represent great challenges for freight transport in terms of level of service, and economic and environmental impacts. Public authorities do not have good track record in selecting the proper measures to address city logistics issues. The paper aims at shaping a city logistics measures' package through the identification of the most common impact areas of widely implemented measures and the correlation of impact areas with sets of measures. This research activity will contribute in better understanding of city logistics, providing an insight of the policies that are mostly used in order to achieve the goals set.

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Keywords: city logistics; measures; impact areas; decision-making; economy; environment

1. Introduction

Urban freight transport is key enabler in the urban economy. However, urban road freight transport significantly affects the livability in the urban context. Economic and social drivers, such as the growing urban population and employment combined with urbanization, have led to enhanced consumption. Statistical data of the urbanization trends are indicative: 73% of Europeans already live in cities and the level of urbanization is expected to reach 82% by 2050. The 85% of the European GDP is produced within urban areas (European Commission, 2013).

As the urban freight transport is intertwined primarily with the distribution of high volume of goods at the 'last-mile' of a supply chain, many deliveries are organized in small parts and distributed in frequent trips, resulting in many vehicle kilometres and high GHG (greenhouse gas) emissions (European Communities, 2006). Researchers have argued that City Logistics could be the solution to the significant impacts of the freight transport on urban environment (Ruske, 1994; Taniguchi and van der Heijden, 2000). The 'City Logistics' concept was first defined by Taniguchi as "the process for totally optimizing the logistics and transport activities by private companies with the

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support of advanced information systems in urban areas considering the traffic environment, its congestion, safety and energy savings within the framework of a market economy" (Taniguchi et al., 1999). 'City Logistics' as a process is also involved in all kind of goods distribution in urban areas and all the activities in which it is implied and that can optimize.

The problems that are caused by inefficient freight distribution as well as the contribution of the urban goods transport to urban economy and environment are depicted below: the vehicle-kilometers that are performed by road transport modes account for 10–18% of the total vehicle-kilometers that are covered within the urban areas and almost 40% of air emissions and noise are attributable to urban distribution fleets (Korver et al., 2012). Furthermore, transport operations that are related to urban distribution hold almost 20% of total energy consumption of transport operations in cities. As far as the economy is concerned, 'last-mile' operations represent 28% of total transport costs in a supply chain (door-to-door services).

In order to mitigate these impacts, a range of goals has been set towards shifting to a more sustainable urban environment. In the Transport White Paper of the European Commission, the 'achievement of CO2-free city logistics by 2030' is laid down as an intermediate goal towards a 60% reduction in GHG emissions (European Commission, 2011). The European Policy in the field of city logistics is to promote integration of city logistics policies into the strategic urban planning and regional economic policy, to foster the development of business synergies and clusters between the core stakeholders, to establish information sharing mechanisms and provision of data exchange between collaborative parties (ICT and ITS may provide innovative solutions in this field), and to efficiently manage the demand through the adoption of suitable measures.

The main objective of this paper is to improve the knowledge in the field of city logistics by shaping a city logistics measures' package through the identification of the most common impact areas of widely implemented city logistics measures and the correlation of core impact areas with sets of measures in order to facilitate policy-makers to select the most tailored solutions in accordance with the objectives set and the impacts that are expected.

The methodology towards achieving the objective unfolds in four basic steps. First, a review of city logistics measures takes place, identifying the most common policies and tools that are used. These measures are separated in different clusters in accordance with their core concept. However, the term "types of measures" that is referred hereinafter implies the way (channel) that a measure is implemented (e.g. 'technological' means that a technological equipment is needed in order to implement the measure, 'regulatory' means that special regulations or legal framework are required in order to introduce the necessary regulatory and operational environment so that stakeholders are legally permitted to run the operational model described in the measure, etc.).

Then, the key impacts of city logistics measures are shaped with respect to the principal sustainability impact categories (economy, environment, society, transport service). The third step includes a review of the impacts of measures implemented in specific areas, identifying good and bad practices applied in real-world. The outcome of this step is presented as qualitative information. The final step entails the cross-examination of core impact areas and measures that are analyzed in the previous methodological steps. This research activity is expected to enable testing of certain city logistics measures by policy-makers, according to the expected impacts they want to achieve and the initial goals set.

2. City logistics measures and clustering

National governments and city authorities are usually lagging behind regarding the effectiveness in selecting the proper policies and measures to address city logistics issues. This gap basically relies on the fact that policy-makers have tended to view freight transport as a problem rather than as an essential activity that they have to serve. Also, these measures have not undergone systematic assessment prior to their implementation, leading to being sometimes unsuccessful or producing unexpected effects that do not correspond to the initial objectives set. It is clear that much more knowledge is needed pertaining to the specific impact areas of each logistics policy that is implemented in the urban contexts.

First of all, a review should be made of the policies and measures that are applied in the urban area in order to deal with the city logistics issues that arise. In order to present the measures and policies that are applied to city logistics, the key players should be identified. These are (Lidasan, 2011):

- *Shippers.* Their main goal is to mitigate the time needed for their product to be forwarded to markets. They also wish for minimizing the storage levels and prevent capital at standstill.
- *Service providers.* They aim at cost reduction of their operation while optimizing the level of service.
- *Consumer.* As final receivers, they are interested in the goods availability, less delays in goods delivery and as parts of local communities, they prefer 'livable' and 'workable' city environment.
- *Government.* Local (public) authorities aim at achieving sound business environment for the private sector, support balanced and competitive markets, establish a healthy environment for people to live and these are succeeded through the regulations they impose.

Among the major categories of city logistics measures that are initiated by public authorities and policy makers are the following ones (non-exhaustive list): infrastructure development, distribution and consolidation centers/intermodal terminals, regulatory measures and license provision, traffic management measures, traffic calming measures and land-use zoning. Likewise, private companies implement innovative business models such as cooperative operations, off-peak deliveries, use of alternative fuel types in the trucks, vehicle scheduling/routing techniques, material handling systems, etc. (OECD, 2007).

Similar categorization has been made by Visser et al. (1999) who summarized policy measures that are related to city logistics and are driven by policy-making stakeholders. The measures are listed according to the types of the issues and requirements that are addressed in the urban freight transport system. They are categorized according to the type of policy (infrastructure, regulatory and economic measures), their concept (land use, networks, terminals, parking, vehicles and cargoes) and the quality of intervention(s) (physical and/or transport/information, regulations/standardization, pricing/subsidies).

Munuzuri et al. (2005) established a compilation of the solutions or initiatives that can be implemented by local administrations in order to improve freight deliveries in urban environments. The solutions proposed are classified into those related to: public infrastructure, land use management, access conditions, traffic management, enforcement and promotion. Van Rooijen and Quak (2014) performed an analysis of the urban freight logistics measures that were implemented under the CIVITAS initiative in European cities. This contribution includes the different measures and their impacts. Russo and Comi (2010) proposed a general classification of measures adopted in an urban scale and an empirical analysis of results was made. The measures are classified into four categories: a) measures related to *material infrastructure*, b) measures related to *immaterial infrastructure* (telematics) or Intelligent Transportation Systems, c) measures related to *equipment* and d) measures related to *governance* of the traffic network.

Taking into account the aforementioned measures, those that are identified in the literature and the respective typology of their categorization, six categories (clusters) of city logistics measures are created that are characterized by different objectives and city logistics elements:

- *New distribution and logistics models for operators.* This category embeds mostly measures that are initiated by the private sector. It could include either cooperative measures or not. Measures that are appointed in this category are: off-peak deliveries, consolidation schemes and joint operations, etc.
- *Capacity sharing.* This category regards measures that entail the use of existing infrastructure or vehicles (i.e. road infrastructure) for multiple operators. The most common measure is the multi-use lanes.
- *Infrastructure development and vehicle characteristics.* ICT, ITS and vehicle technology based measures are identified in this category. Furthermore, the construction/development of consolidation/distribution centers and logistics places fall under the umbrella of this category.
- *Access control.* Policies and measures that imply access restrictions to certain areas based on concrete constraints (environmental, vehicle weight, etc.), traffic calming measures and other are included in this category.
- *Regulations on enabling activities.* Regulatory measures that determine logistics processes such as loading/unloading, time windows, parking regulations and other soft measures that do not apply to none of the aforementioned categories belong to this category.
- *Enforcement, routing optimization and training.* Police enforcement actions, training activities (eco-driving, etc.) and routing optimization (infrastructure and road marking for route optimization) are among the measures that form this category.

Inevitably, the selection of measures and their categorization is an empirical process subject to overlapping issues. Nevertheless, the criteria were basically the objectives of each category and not the implementation channels and policy design.

3. Core impact areas

The operations of road freight transport modes in the urban areas contribute to the environmental burdening, as they generate harmful air emissions at a higher degree, as compared to trips covered by cars or motorcycles. This rests on their inherent features and their service objectives. In addition, their fuel consumption per km is higher compared to passenger vehicles. Furthermore, the traffic congestion that is created affects the level of mobility and road safety of both drivers and pedestrians, cyclists. In this regard, the urban operations of freight vehicles cause a wide range of direct impacts and side effects. In order to distinguish these effects, we could separate them into four impact areas; three, according to different dimensions of sustainability, economy, environment and society (Anderson et al., 2005; UK Round Table on Sustainable Development, 1996; (Behrends, 2011); as fourth area, 'customer service' is added, which is a component of the urban and interurban freight transport context (STRAIGHTSOL, 2012).

Economy. Economic impact is considered through the estimation of benefits that are derived from a measure, in relevance with the costs that are generated by its development. This includes operational costs and revenues, energy consumption, and resource waste and (initial) investment(s). Hence, it is focused on the financial perspective of the measure.

Environment. Environmental impact includes the assessment of the impacts of transport in terms of global and local emissions, air quality, visual intrusion and noise nuisance. Impacts in this category are pollutant emissions including the primary greenhouse gas carbon dioxide and other air emissions (climate change), the use of non-renewable fossil–fuel, land and aggregates, waste products, and the effects on natural ecosystems.

Society. Social impact refers to the uptake of a measure by the (local) community and its perspective on how people perceive the environment in terms of attractiveness and nuisance. This includes congestion, which, in turn, may have further effects on the livability in cities; also, consequences of pollutant emissions on public health, traffic accidents, noise nuisance, visual intrusion and quality of life.

Transport (Customer Service). Transport impact regards the performance of a freight transport system. Emphasis is place on understanding how much the measure contributes to more efficient and reliable freight transport. The transport impact area regards mainly the quality of service in terms of the quality and reliability of the freight transport service.

4. Implementation of city logistics measures and recorded impacts

The salient objective of this paper is to determine the impact areas of the most widely implemented city logistics measures in order to link the city logistics measures with particular impact areas. To this end, a review of almost fifty cases implemented city logistics measures has been based on findings from European research projects, which led to a categorization of measures.

The empirical method that was followed relied on the interpretation of data into a qualitative form through the transformation of the values of identified impacts to a simplified qualitative scale: very positive, positive, slightly positive, neutral, negative and n/a, that stands for no data/reference to this kind of impact area. The rationale was to put the data figures into a homogeneous scale of qualitative levels. The basis for this approach was that impacts between certain case studies (of measures implemented) could not be effectively compared because of the existence of a variety of factors that determine the actual impacts, either 'internally' (concerning the way that measures were planned and implemented) or 'externally' (concerning the way that the urban context 'accommodated' the measures or there were some adjustments, such as legal, administrative, policy-oriented, construction). As an example, a reduction of the CO2 emissions by 15% might appear as an impressive achievement in city A but as a moderate achievement in city B, where the reduction potential may be higher.

This method relies, also, on the fact that the majority of the city logistics measures that were reviewed had a track record of positive impacts concerning all four impact areas, when tested previously, and so it was expected that the

overall impact would be, more or less, positive. Local structural characteristics do, however, play an important role on the degree of success but their role is confined for our research scope. Besides this, in the majority of the reviewed cases, the improvement of the impact profile that was recorded ranged between 0-20% compared to the 'do-nothing' scenarios under all four impact areas, apart from a few isolated cases that presented negative impacts and some other cases indicating significant positive changes. It should be noted that negative impacts were only pinpointed in very few cases reflecting slightly adverse changes of the impact areas.

Table 1. Correspondence between qualitative scale of the impact assessment to recorded (quantified) impacts.

Very positive	>20%	Represents a 'positive' change in the measured performance of the impact area of over 20% compared to the situation before the implementation of the measure
Positive	10-20%	Represents a 'positive' change in the measured performance of the impact area between 10-20% compared to the situation before the implementation of the measure
Slightly positive	0-10%	Represents a 'positive' change in the measured performance of the impact area between 0- 10% compared to the situation before the implementation of the measure
Neutral	±0%	Represents that the implementation of the measure had no significant impacts compared to the situation before the implementation of the measure
Negative	<0%	Represents a negative change of the quantified impacts
N/A	-	No information available for this impact area

Therefore, the above method was followed due to the fact that it has not been possible to precisely compare the impacts of measures as the characteristics of each measure, the degree of implementation, the urban environment that accommodates the measure and other factors are totally different for each measure. As such, it was necessary to structure a generalized approach.

Table A (Appendix) portrays the city logistics measures that are implemented in cities around the world and their degree of impacts for each impact area.

The first column includes the (research) project which described the measures and the impacts that were identified. The column 'Place' refers to the location where the measures were implemented and the column 'Measure' outlines the main attributes of each measure. 'Type of measure' regards the nature of each implemented measure with respect to its type (regulatory, technological, cooperation, new business model, etc.). Then, the four impact areas include data such as the magnitude of impacts identified (very positive, positive, slightly positive, neutral, negative, no information). In the last column, each case is allocated to relevant measures' clusters. The measures' clusters were created according to certain criteria that are mentioned in a previous chapter.

5. Identification of core impact areas and package wrap-up

The approach that was followed in order to capture the core impact areas of each measure and, in turn, each measures' cluster resulted in identifying the impact areas that indicated and accepted degree of positive impacts, namely very positive and positive impacts after the implementation of each measure. This entails that changes in the operational framework caused an over 10% of positive deviation to the measurement of the performance indicators compared to the 'business-as-usual' levels.

In this regard, for each measures' cluster and for each impact area, the proportion of literature sources that indicated very positive and positive impacts (core impacts) out of the total number of literature sources that were reviewed was calculated. As a result, the degree of the strength of each impact area was acknowledged for each measures' cluster. This implies that the higher the proportion, the more affected impact area. Fig. 1 depicts the proportion of the total number of the reviewed literature sources that indicated very positive and positive impacts for each one of the four impact areas and under each measure cluster. Each impact area is independent of the other ones, therefore the sum of the proportions may differ from 100%. Also, the proportions in Fig. 1 should be studied column wise, and not across columns, as different scales may apply.

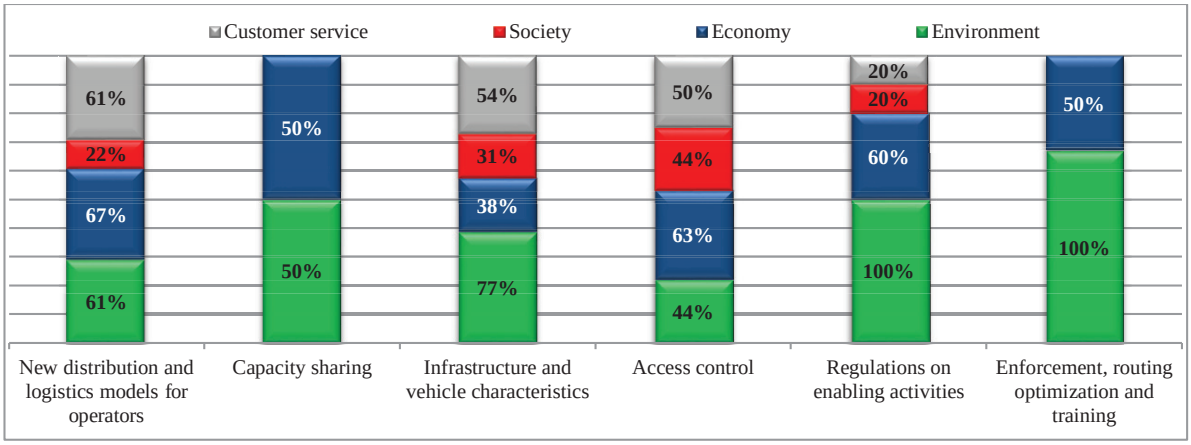

Fig. 1. Percentage of positive *impacts per impact area and* measures' cluster.

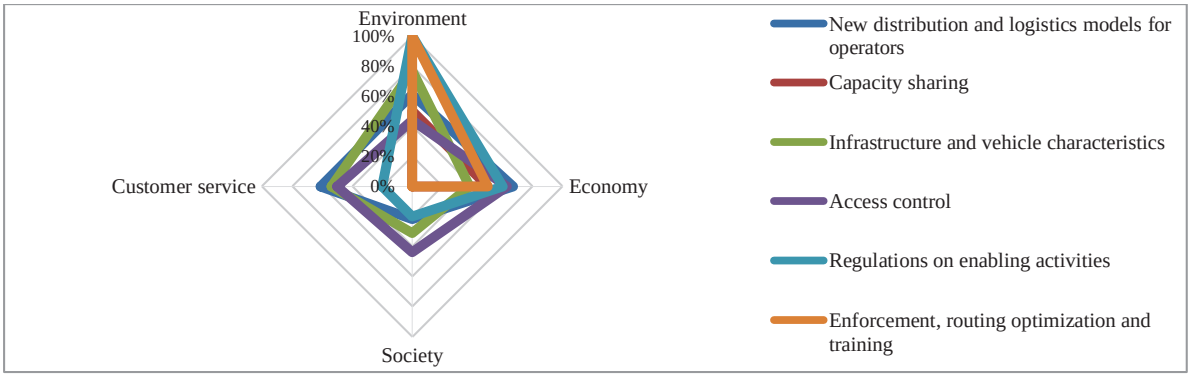

Fig. 2. Degree of impacts of each measures' cluster.

Moreover, an analysis has been performed regarding the nature (regulatory, cooperative, etc.) of each measure and the core impact areas according to the aforementioned approach. The approach that was followed in this categorization process takes over the approach pursued in measures' clustering.

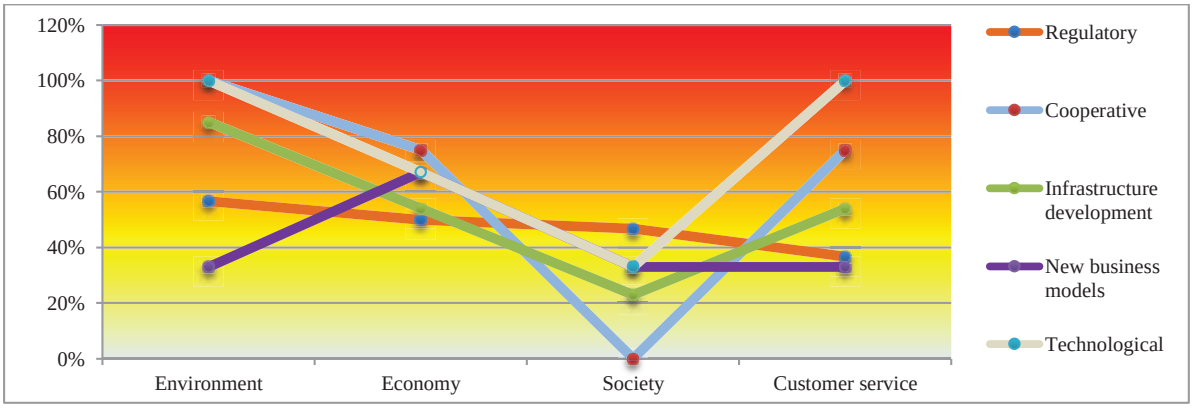

Fig. 3. Comparison of the identified core impacts for different types of measures.

The outcomes of the analysis being reflected in Fig. 3 contribute in realizing the impacts that are expected to be generated after the implementation of a city logistics measure. For instance, the analysis showed that in many cases the technological (ITS, ICT, etc.) and the cooperative (joint operations, consolidation schemes, etc.) measures that have been implemented tend to produce positive environmental, economic and customer service impacts. This could be explained by the fact that investing in technological advancement or in establishing new cooperative business schemes is usually private-oriented initiatives that stem from the need of private operators to achieve higher economies of scale, reduce their operational costs and improve their level of service.

In order to delineate the core impact areas of each measures' cluster, the analysis that was carried out revealed the following elements (Fig. 4):

- *New distribution and logistics models for operators.* The measures that fall under this category produced more positive impacts on the fields of economy and customer service of the private operators.
- *Capacity sharing.* This measures of this category achieved higher performance in the fields of environment and economy.
- *Infrastructure development and vehicle characteristics.* The city logistics measures that included the development of new infrastructure and/or the change in vehicle technology resulted in generating very positive environmental impacts in conjunction with increasing the customer service.
- *Access control.* Although such policies are usually initiated by public authorities in order to address urban environmental issues (as resulted by the analysis), the impacts that were recorded indicated an enhancement in the performance of customer service of private operators combined with the positive economic impact.
- *Regulations on enabling activities.* The core impact areas that were identified in the analysis are: environment and economy.
- *Enforcement, routing optimization and training.* Finally, not many city logistics measures were associated with this category. Highly positive impacts were identified in the field of environment and economy.

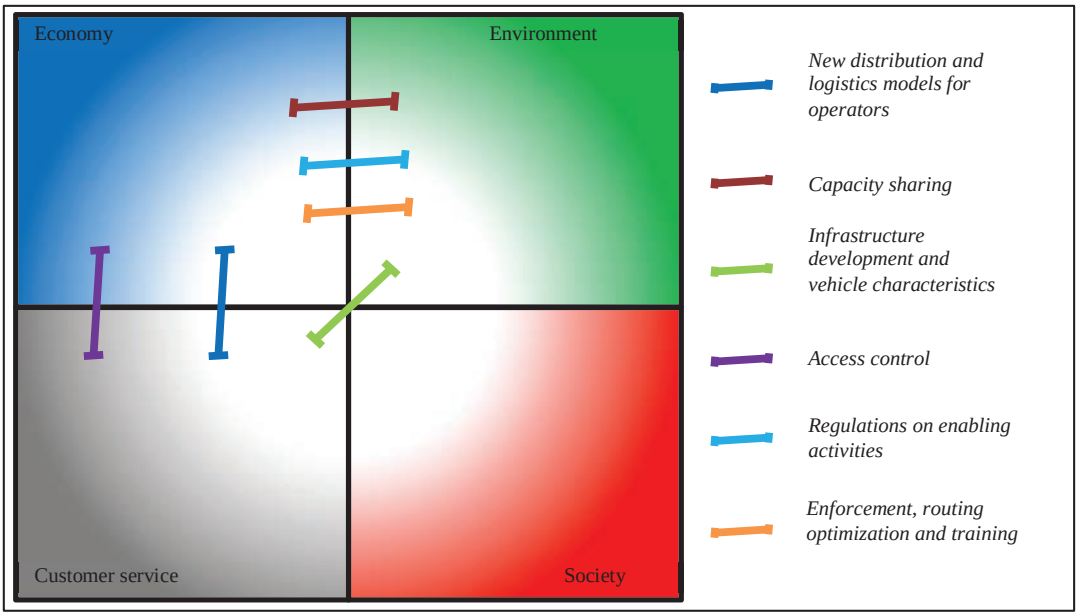

Fig. 4. Schematic depiction of core impact areas for each measures' cluster

6. Conclusion

Due to the multi-faceted character of city logistics issues and the significant diversity in the structural features

between cities, many times cities face unexpected impacts when policy-makers choose to implement specific measures without prior assessment. The diversity relies on a variety of factors such as the size of the urban area, the city homogeneity, the commercial density, the layout of the road network, the city type, the level of congestion, the level of compliance with the regulations, existing restrictions applied, etc. (STRAIGHTSOL, 2014).

Leaving aside these fundamental differences between city contexts, it would be useful to understand how the implementation processes of city logistics measures work, grasp the experience of implementing different types of measures to different regional and local contexts and capture the logical chain of effects. The core objective of the analysis was to identify the impact areas of a variety of city logistics measures, attempting to correlate the main attributes of each measure with expected impacts; hence, to facilitate the decision-making process and strengthen the effectiveness of the chain 'objective-measure-impacts', adding knowledge value to the phase of selecting and testing measures.

Another point that should be stressed is the equivocal character of some city logistics measures. As the urban environment constitutes multi-dimensional area, policy-making and implementation of political measures appear as great challenges. It is a common issue some city logistics measures, aiming at tackling specific problems, to cause side effects and/or rebound effects. For instance, night deliveries might generate high noise nuisance to adjacent residences, which is a severe social impact; freight vehicles mitigation might unlock new layers of demand for transport on the road network producing an overall null outcome on traffic. The policy measures that are (usually) initiated by the public sector and aim at facing social or environmental problems should be very carefully planned in order not to create negative impacts to the private sector that may outweigh the positive ones. Also, where possible, efforts should be made towards consensus building especially when the measures are implemented by private companies and it is expected that the impacts will affect wider areas.

The outcomes of the analysis provide useful insight in three main areas:

a. The most city logistics measures that have been implemented achieve high environmental performance and they also have great contribution in the (private) economy. This rests on the fact that the paramount goal of many city logistics measures is to mitigate the urban congestion, in certain areas, and this, in turn, leads to lower energy needs for vehicles and less congestion, lower vehicle emissions, and other respective impacts.
b. The social impacts (visual intrusion, noise nuisance, urban attractiveness, upgrade of level of road safety) tend to be confused with the environmental ones. As such, few literature sources made reference to the society as a discrete impact area and even fewer stated positive impacts to the society, in terms of the factors mentioned before. It is clear that positive impacts on the environment imply better physical and mental health, which is also considered as positive impacts on society.
c. The most balanced approach seems to be the implementation of measures that establish access restrictions to certain type of vehicles. The analysis revealed positive impacts to all four impact areas. This could be explained by the fact that imposing access restrictions to certain urban areas causes multi-fold impacts, such as i) rapid mitigation of traffic congestion, ii) direct environmental alleviation, iii) increase of the perceived level of road safety, and iv) more efficient and reliable deliveries in this area.
d. The cooperative strategies and business models resulted in the achievement of increased load factors and improved economic profile for the transport operations. Apart from the economic benefits, the review showed that such measures achieve high environmental output in conjunction with the provision of better level of service. Cooperative measures is the category that achieves the highest overall impact scores but for the Society impact area. This could entail that a wide range of stakeholders enjoys the benefits of the promotion of cooperative operational models and this renders the category of best value-for-money solution in city logistics, as derived from this research.
e. However, measures that introduce advanced technological systems (ICT and ITS) scored very well in the impact area Customer Service. The enhanced visibility of supply chain combined with information sharing capacity that are provided have proved to contribute in raising the level of service and reliability of transport and 'last-mile' distribution.

In this research, an attempt has been made to adopt a generic approach to estimate the core impacts of the most implemented city logistics measures. It has be taken into account that, the exact performance of each measure varies

and depends on the local stakeholders' intervention and cooperation, city characteristics and urban network, local demand and supply patterns, which attribute to the performance of closed or open national economies, the particularities of transported cargo, local users behavior, constraints and regulatory framework. This shortcoming has also been addressed in this research where similar city logistics concepts applied in different urban contexts around the world have delivered different outcomes. These local and regional characteristics are – among other – the ones that determine the applicability and transferability potential of city logistics policies among different urban contexts.

Appendix A. Reviewed city logistics measures

The following table constitutes a list of the city logistics measures that were reviewed within the context of relevant research projects, their categorization to most relevant measures' cluster and their impact areas (Torrentellé et al., 2012; TURBLOG, 2010; BESTFACT, 2013; Ruesch and Glücker, 2001; TRAILBLAZER, 2013; SUGAR, 2011; Dasburg and Schoemaker, 2006).

Table A. City logistics measures that were reviewed and recorded impacts.

Project	Place	Measure	Type of Measure	Envir.	Econ.	Society	Customer service	Measures' cluster
C-LIEGE	Aachen	Pooling of inner-city freight delivery	Cooperation	-	Negative	-	-	*New distribution and logistics models for operators*
-	Fukuoka	Multi-carrier joint delivery service	Cooperation	-	Positive	-	Positive	*New distribution and logistics models for operators*
TRAILBLAZER	London	Freight consolidation platform	Cooperation	Very positive	Very positive	-	Very positive	*New distribution and logistics models for operators*
TURBLOG	Tokyo	Joint delivery system	Cooperation & new business models	Very positive	Positive	-	Very positive	*New distribution and logistics models for operators*
TURBLOG	Paris	Electric delivery vehicles for final deliveries	Cooperation & vehicle technology	Very positive	Positive	Positive	Positive	*New distribution and logistics models for operators*
SUGAR	Bordeaux	ELP (Delivery areas)	Infrastructure	Positive	Slightly positive	Positive	Positive	*Infrastructure development and vehicle characteristics*
CIVITAS VIVALDI	Bristol	Freight Consolidation Schemes	Infrastructure & cooperation	Positive	Positive	-	Very positive	*New distribution and logistics models for operators*
SUGAR	La Rochelle	Urban Consolidation Centre	Infrastructure & cooperation	Very positive	-	-	-	*Infrastructure development and vehicle characteristics*
SUGAR	London	Construction consolidation center	Infrastructure & cooperation	Very positive	Positive	-	Neutral	*Infrastructure development and vehicle characteristics*
CIVITAS SMILE	Norwich	Urban transshipment center	Infrastructure & cooperation	Positive	Positive	-	Positive	*Access control*
CIVITAS SUCCESS	Stockholm	Logistics center	Infrastructure & cooperation	Positive	Positive	Positive	Positive	*Infrastructure development and vehicle characteristics*

SUGAR	Paris	Urban rail logistics	Infrastructure & intermodality	Very positive	Negative	Negative	Positive	*Infrastructure development and vehicle characteristics*
SUGAR	Zurich	Cargotram. Waste collection with tram.	Infrastructure & regulatory	-	-	-	Positive	*Infrastructure development and vehicle characteristics*
-	New York	ITS	Infrastructure & technological	Positive	Positive	-	-	*New distribution and logistics models for operators*
-	Barcelona	Urban Logistics Space & clean vehicles	Infrastructure & vehicle technology	Positive	Positive	-	-	*Infrastructure development and vehicle characteristics*
SUGAR	Padua	UCC and clean vehicles	Infrastructure & vehicle technology	Slightly positive	Slightly positive	Slightly positive	-	*New distribution and logistics models for operators*
TURBLOG	Paris	New delivery service exclusively using "cargo cycles" or electrically powered tricycles - underground Urban Logistic Spaces (ULS)	Infrastructure & vehicle technology	Very positive	Slightly positive	Slightly positive	-	*Infrastructure development and vehicle characteristics*
C-LIEGE	Szceczin	Packstations 24/7-e-postal (e-commerce) with lockers	New business model	-	-	-	Positive	*New distribution and logistics models for operators*
TURBLOG	Mumbai	Private logistics service - Dabbawala (one who carries the box) is a person Mumbai whose job is to deliver freshly made food packed in lunch boxes from home to office workers.	New business models	Very positive	Positive	Neutral	Neutral	*New distribution and logistics models for operators*
TURBLOG	Beijing	Reform the storage & distribution planning and management	New business models & infrastructure	-	Positive	Very positive	Slightly positive	*New distribution and logistics models for operators*
CIVITAS ARCHIMEDES	Aalborg	Environmental Zones	Regulatory	Very positive	Neutral	-	-	*Access control*
CIVITAS MIMOSA	Bologna	Urban Freight Delivery Plan - Platform & access restrictions	Regulatory	Positive	Positive	Positive	Positive	*Access control*

CIVITAS MODERN	Brescia	Access restrictions - Limited traffic zones	Regulatory	Slightly positive	Positive	Neutral	-	*Access control*
START	Bristol	Time windows for deliveries	Regulatory	Positive	Positive	-	-	*Regulations on enabling activities*
CIVITAS MODERN	Craiova	Freight distribution schemes - access control	Regulatory	-	Very positive	Very positive	-	*Access control*
START	Göteborg	Incentives - time windows for increased load factors	Regulatory	Very positive	-	-	-	*Regulations on enabling activities*
CIVITAS ARCHIMEDES	Iasi	Traffic access and parking restrictions	Regulatory	Positive	Very positive	Very positive	Positive	*Access control*
SUGAR	London	Low Emission Zones	Regulatory	Slightly positive	-	-	-	*Access control*
TURBLOG	Mexico	Access restrictions & environmenta l lanes	Regulatory	Positive	Positive	Positive	Positive	*Access control*
-	Dutch cities	Off Hour deliveries	Regulatory	Positive	Positive	-	-	*New distribution and logistics models for operators*
TURBLOG	New York	Off Hour deliveries	Regulatory	Slightly positive	Positive	Positive	Positive	*New distribution and logistics models for operators*
SUGAR	Prague	Access restrictions (weight based)	Regulatory	-	-	-	Positive	*Access control*
CIVITAS ARCHIMEDES	San Sebastian	Limited Traffic Zones	Regulatory	-	-	Positive	Positive	*Access control*
SUGAR	Stockholm	Congestion charging	Regulatory	Positive	Very positive	Positive	-	*Regulations on enabling activities*
TURBLOG	Utrecht	Low Emission Zones	Regulatory	Positive	-	Positive	-	*Access control*
SUGAR	Utrecht	Low Emission Zones	Regulatory	Slightly positive	Negative	Positive	-	*Access control*
CIVITAS MODERN	Vitoria-Gasteiz	Superblocks & traffic calming	Regulatory	Very positive	-	-	Positive	*Regulations on enabling activities*
CIVITAS CARAVEL	Genoa	Goods distribution scheme - access controls	Regulatory & cooperation	Slightly positive	Very positive	Positive	Positive	*Access control*
C-LIEGE	Parma	Limited Traffic Zones & Freight Quality Partnerships	Regulatory & cooperation	Very positive	Positive	Positive	Positive	*Access control*

C-LIEGE	Parma	Environmental permission for trucks ("Ecologistics permit") to get into the city center - Urban Distribution Centre	Regulatory & cooperation	Positive	-	Positive	-	*Access control*
SUGAR	German cities	Packstations - B2C urban locker boxes	Regulatory & infrastructure	Positive	Positive	Positive	Positive	*New distribution and logistics models for operators*
SUGAR	Netherlands cities	Silent deliveries	Regulatory & infrastructure	Slightly positive	Slightly positive	-	-	*New distribution and logistics models for operators*
SUGAR	Barcelona	Multi-use lanes	Regulatory & Technological	Slightly positive	-	Slightly positive	-	*Capacity sharing*
SUGAR	Bremen	Lorry routes	Regulatory & technological	Positive	Positive	Neutral	-	*Capacity sharing*
CIVITAS MIMOSA	Tallinn	Marking Routes for Smooth Freight and City Logistics	Regulatory & technological	Positive	Positive	-	-	*Enforcement, routing optimization and training*
SUGAR	Several cities in Swiss	Heavy-goods vehicle fee on urban roads	Regulatory & technology	Positive	Very positive	-	-	*Regulations on enabling activities*
SUGAR	Region Emilia Romagna	Electric vehicles	Regulatory & vehicle technology	Positive	Slightly positive	Positive	-	*Infrastructure development and vehicle characteristics*
CIVITAS SMILE	Norwich	Priority access for clean goods vehicles	Regulatory and vehicle technologies	Slightly positive	Slightly positive	Slightly positive	Positive	*Infrastructure development and vehicle characteristics*
C-LIEGE	Leicester	Intelligent Control of Traffic lights	Technology	Positive	Positive	Very positive	Positive	*Infrastructure development and vehicle characteristics*
CIVITAS VIVALDI	Bremen	Consolidation systems and logistics e-platform	Technology & cooperation	Positive	Very positive	-	Very positive	*New distribution and logistics models for operators*
SUGAR	Paris	Lockers	Technology & regulatory	Positive	Neutral	-	Positive	*New distribution and logistics models for operators*
START	Bristol	Driver's Behavior - Incentives, eco-driving, training	Training	Positive	-	-	-	*Enforcement, routing optimization and training*
SUGAR	Rouen	Electrically assisted tricycles for deliveries	Vehicle technology & regulatory	-	-	-	Very positive	*Infrastructure development and vehicle characteristics*
TURBLOG	Utrecht	The Cargohopper: multi-trailer, solar powered road train riding on pneumatic tyres - Delivering parcels	Vehicle technology & regulatory	Very Positive	Slightly positive	Slightly positive	Positive	*New distribution and logistics models for operators*

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