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Cleaner and better transport in cities

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Cleaner, safer and more efficient freight transport in cities

Transporting goods with lorries or vans by road is still the principal method used to managing freight in cities, despite the environmental and economic impacts. Freight and distribution schemes are often structured in traditional ways, with individual solutions which do not solve larger problems.

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Going beyond clean passenger transport: Urban freight transport

The demand for urban freight transport has increased due to the concentration of the population in urban areas, and the majority of industrial production is delivered to towns and cities. Cities and regions must also deal with an increasing specialisation of the urban and economic system, with a global division of production and its associated freight. Transportation of goods, both over long distances and within cities, contributes a substantial part of the total emissions generated from the transport sector, as well as congestion. Depending on the circumstances, freight accounts for 10-15 percent of vehicle equivalent kilometres travelled in urban areas, 2-5 percent of jobs in urban areas, and 3-5 percent of urban land use. Lorries account for 22 percent of the global greenhouse gas emissions generated by transportation, but due to circulation conditions in urban areas this share is higher. For instance, in large European cities, freight transport is responsible for a third of transport-related nitrogen oxides and half of transport-related particulate matter emissions, mostly due to a greater reliance on diesel fuels for trucks.[1] Most freight journeys start or finish in urban areas, and more than 50 percent of freight tonnes transported by road in Europe are travel distances of less than 50 kilometres.[2]

Harbour and industrial cities are particularly affected by the freight and logistics sector, as well as areas with intense construction work which can become seriously congested with heavy cargo traffic. Therefore, managing freight traffic should be part of an overall transport master plan and included in a city's urban transport policy.

Optimising goods delivery can be achieved through several types of measures:

- Initiating a strong partnership between all stakeholders and operators, for example by creating a voluntary charter to agree on concerted and harmonised activities for goods delivery in the city. Such a freight partnership could comprise food retailers working together on local deliveries and distribution aided by Intelligent Transport Systems (ITS) communication to minimise the number of delivery trips to shops and customers by sharing loads and maximising vehicle capacities.

- Creating logistics platforms, which integrate trade, commerce and industry, logistics, services, and freight companies, such as within urban distribution centres which typically offer logistics terminals, room for storage, and loading bays.

- Creating legal frameworks and regulations to oblige carriers and operators to cooperate.

1 UNHABITAT, Planning and design for sustainable urban mobility, Global report on human settlements 2013
2 Dotter et al, 2014. SMARTSET contributes to cleaner, safer and more efficient future freight transport and to a sustainable development of cities.

- Defining coherent regulations for access to urban areas for commercial vehicles delivering freight (e.g. only during fixed times or permitting access only to vehicles meeting specific emissions standards).

- Raising public awareness as it can influence how retailers manage their freight delivery patterns. Retailers in turn can put pressure on the freight hauliers and distributors.

- Creating freight maps and signage to show the most suitable freight routes to key areas in a city and highlighting obstacles as well as areas that should be avoided, such as low bridges, tight turns, narrow streets, residential or pedestrian areas, etc.

- Managing parking spaces for loading and unloading goods in an area.

- Introducing ITS technologies and web-based logistics coordination systems enabling more efficient transport planning.

- Introducing clean vehicles and intermodal transport for last-mile distribution. Electric, hybrid, and vehicles fueled by compressed natural gas (CNG) have been proven to perform well in terms of urban freight distribution. The use of small low-emission vehicles for distribution will improve the local environment due to the decrease in greenhouse gas and particle emissions, as well as reduced congestion and improved road safety, and should therefore be encouraged.[3]

Furthermore, measures can be implemented to enhance safety and security and to protect citizens from accidents with well-designed and well-regulated transport systems, such as by introducing speed limits for heavy vehicles in different areas. Due to the extremely negative consequences on residents and the environment, it is especially important that the risk of incidents involving the transportation of dangerous goods is minimised e.g. by implementing fixed routes for such deliveries.

3 Roider, Dotter, CIVITAS II Policy Advice Note: Logistics and freight distribution

Urban freight transport has been a hot topic for CIVITAS since 2002

Goods delivery makes up a significant share of traffic in European cities and is a major contributor to carbon emissions and congestion. CIVITAS cities encourage the use of cleaner freight vehicles and are developing solutions to better coordinate freight logistics. More efficient freight deliveries can reduce congestion and emissions, and free up space for sustainable transport modes.

CIVITAS I | Gothenburg (Sweden)

Incentives for purchasing clean heavy duty and distribution vehicles

In 2002 in Gothenburg there was a large quantity of freight deliveries travelling in and through the city. An increase in this kind of traffic was predicted, which would cause major problems for the city's urban and traffic planners, both from the point of view of health and congestion. To comply with European Air Quality Standards[4], which became legally binding from 1 January 2006, it was necessary to decrease emissions. The solution to the traffic congestion and the increased traffic pollution relied on a mixture of mobility management and technology.

This demonstration measure aimed at improving the air quality of the city of Gothenburg by decreasing emissions of NO_x and particles from heavy traffic and distribution by creating opportunities for environmentally sound transport. The objectives of the measure were, on the one hand, to promote alternative fuel technology, and on the other hand to influence the private sector to choose vehicles fuelled by CNG or compressed biogas (CBG).

From its start in 2002, the demonstration measure was intended to encompass the major transit road to the outer harbour, as all the heavy traffic to the harbour passes through this area and it was predicted that the European Air Quality Standards for NO_x could be breached in this location. The demonstration was however later broadened to include the whole of Gothenburg and to include urban freight transport. The major activities were to promote alternative fuel technology and to build a CNG fuel station in the industrial area of Deltavägen rather than at port. Furthermore, two large and 16 lighter distribution vehicles were introduced in Gothenburg in collaboration with three other partners. Finally, the co-operation with the Traffic and Public Transport Authority in Gothenburg and the private sector was key to the measure's success.

The measure resulted in an annual reduction in NO_x emissions of 3.55 tonnes and an annual shift of 500,000 kilometres from diesel to CNG powered vehicles. Levels of nitrogen oxides decreased by four to five times compared to conventional fuels. The new CNG fuel station in Gothenburg delivered 660,000 cubic metres CNG between March 2003 and November 2005. Compared to other new stations, this is 50 percent above average. The reason for the high delivery rate is the location of the station, as it is situated in an industrial area with a high transport demand close to the city and major highways. By engaging in dialogue with customers, the project increased customer interest in clean transport within the private sector.[5]

4 Air Quality Standards, accessed October 01, 2015, http://ec.europa.eu/environment/air/quality/standards.htm
5 Incentives for purchasing clean heavy duty and distribution vehicles, CIVITAS Initiative, accessed June 25, 2015, http://www.civitas.eu/content/incentives-purchasing-clean-heavy-duty-and-distribution-vehicles

CIVITAS II | La Rochelle (France)

Strategic extension of the ELCIDIS platform for city logistics

The idea of consolidating goods on the urban periphery for subsequent delivery to retail outlets has been explored since the 1970s, but never successfully implemented. The closest examples of city logistics in Germany were based on freight-forwarding companies, but these were not driven primarily by environmental concerns.

La Rochelle Urban Community launched the ELCIDIS (Electric City Distribution System) experimental hub in February 2001 as part of the ELCIDIS European project. The objective was to optimise goods distribution in the city's historical centre with an environmentally friendly approach. The ELCIDIS platform engaged in two distinct types of activities: delivery of parcels and auxiliary services with electric vehicles. ELCIDIS was designed not only to promote deliveries using electric vehicles, but also to relieve traffic congestion in the centre by re-organising deliveries. To achieve this, a new traffic regulation was passed: heavy freight delivery vehicles exceeding 3.5 tonnes in weight were allowed to deliver within the perimeter only between 6:00 and 7:30 in the morning. By the end of 2005, the results of this experimentation were generally satisfactory, although there were several constraints related to organisation, vehicle sizes and ages, delivery areas, and services which limited the possible extension and life of the whole system.

Since severe barriers were identified, the objectives were not only to solve the problems they generated or to improve the whole system, but to redesign ELCIDIS to take into account a larger scope of goods and services, using new technologies, and defining a methodology for developing a systematic approach to urban goods transportation that could be transferred to other towns in the La Rochelle Urban Community.[6]

6 Strategic extension of the ELCIDIS platform for city logistics, CIVITAS Initiative, accessed June 25, 2015, http://www.civitas.eu/content/strategic-extension-elcidis-platform-city-logistics

CIVITAS PLUS | Ljubljana (Slovenia)

Integrated freight policy development

Freight transport in Ljubljana has significantly increased, particularly since Slovenia joined the EU. There are several distribution locations and many freight operators in Ljubljana which are based in different locations in the city, especially in the suburbs. A lack of coordination among the operators causes a large number of transport operations and predictably lower load factors than would be possible with coordinated logistics. With the implementation of a pedestrian zone in the city centre in 2008, the freight delivery times were shortened from 6:00 to 9:30 in the mornings. During this time period freight delivery vehicles were causing congestion in the city centre. The establishment of a stakeholder partnership was therefore strongly connected to the implementation of this measure.

The city of Ljubljana established its first local freight network in 2006. It is made up of representatives from the city administration, road hauliers and logistics companies, retailers and service providers, manufacturing companies, couriers, access restriction managers and research organisations. Ljubljana has been leading the process of establishing new freight networks in other CIVITAS ELAN cities[7].

In the start-up phase, local freight networks were established in all partner cities. Each network was tailored to the respective city's needs and level of user acceptance. The cities stress that it is important to include representatives from the entire transport chain, from suppliers to customers, which they did. Active participation in and support for the freight network was formalised through a memorandum of understanding or a similar agreement among members.

In each city, 10-20 partners gathered to join the freight network and work together in close collaboration with the CIVITAS ELAN consortium throughout the project lifetime. The discussions and work of the networks influenced and informed the working practices, policies and plans of the members and promoted best practice more widely. The main outcome was an urban freight approach developed in a cooperative manner that includes all stakeholders.

Promotion of freight delivery solutions has been the key activity so far, and it will continue.[8]

7 The cities of Ljubljana (Slovenia), Ghent (Belgium), Zagreb (Croatia), Brno (Czech Republic) and Porto (Portugal) joined together in the CIVITAS ELAN project 'Mobilising citizens for vital cities'. They have agreed on the mission, to 'mobilise the citizens by developing with their support clean mobility solutions for vital cities, ensuring health and access for all'.

8 Implementation status report on the establishment of local freight networks in all partner cities, ELAN Deliverable 7.1-D, 2012



What is happening now?
Urban freight transport with a focus on small- and medium-sized cities

Although the precise definition of small- and medium-sized cities has been under debate for many years, it is obvious that there are differences in urban logistics between large conurbations and smaller but more numerous, regional European cities. Most of these small- and medium-sized cities are built around a historic city centre with several types of shops as well as craftsmen and small industries. Freight transport in such cities depends, as in larger ones, on the topography, the organization of the city, the urban structure and the local authority's strategies. Many of the logistics problems are common to both types of cities, so some knowledge transfer or adaptation of best practices can be considered, but the dimensions (spatial, social, economic, normative) generate specific conditions for goods transportation in medium-sized cities.

Smaller sizes lead to shorter distances and transport of goods being carried out quickly. This makes it more difficult to look for improvements and to convince stakeholders to modify their behaviour, which they may have optimised from their own point of view.

However, even if in absolute terms the time wasted in congestion is less in these cities, it still feels significant, and the ratio between trip duration and time wasted is more or less the same as in larger cities; so the impacts are subjectively as important as in larger cities. The smaller size allows also a better control of goods flows. Since entry points are fewer, it is easier to supervise city centre access. In medium-sized cities people are often closer to their neighbourhood, more active in city life, and closer to the local authorities and politicians than in larger cities. Consequently, the impacts (positive or negative) of the improvements are quickly analysed and any decisions or changes can be made with the active participation of the people concerned. But the sensitivity to normative or regulatory actions is also increased; if, for example, the access for goods in the city centres is more difficult then shops will quickly migrate to shopping centres in the outskirts. This means, that justifying changes to freight transport often requires the adoption of a global view of all transport operations in a city.[9]

The following list highlights a few European projects as well as initiatives of private companies that convey the current focus on the theme of urban freight transport.

- The SMARTSET project[10] develops and shows how freight transport in urban areas can be made more energy-efficient and sustainable by better use of freight terminals. To achieve this, the project is structured around three core aspects for creating successful and attractive terminals: market-based business models, clean and energy-efficient vehicles for last mile distribution, and incentives and regulations to improve the possibility to make business models profitable and financially sustainable. The eight application sites in SMARTSET are working together to promote the need for more efficient solutions that lead to fewer transport kilometres and more sustainable economic models. SMARTSET is undertaking a joint initiative involving these three core aspects for creating successful and attractive terminals.[11]

9 Breuil, Dotter, Sprunt, CIVITAS thematic leadership programme within CIVITAS II
10 The SMARTSET project is co-funded by the Intelligent Energy - Europe programme of the European Union, and runs from June 2013 until May 2016 http://smartset-project.eu
11 Dotter et al, 2014. SMARTSET contributes to cleaner, safer and more efficient future freight transport and to a sustainable development of cities.

The CycleLogistics project aims to reduce energy consumption and emissions from freight transport in urban areas by triggering near zero-emission logistics applications across Europe. This will be done by increasing the use of cargo bicycles as an alternative to conventionally-fueled vehicles and by encouraging municipalities to implement favourable conditions that facilitate the development of near zero-emission urban logistics and allocate responsibility for these issues within the municipality. Furthermore, by raising awareness among private and commercial end users and their associations about their power to influence the development of zero-emission urban logistics solutions and by ensuring international networking and knowledge exchange, the project aims to contribute to an improved climate for the development of near zero-emission urban logistics across the EU.[12]

In 2010 the Austrian Post decided to reduce its CO_2 emissions by 20 percent by 2015. This was an ambitious goal; the reduction of greenhouse gas emissions is a complex task for one of the largest logistics companies in Austria. The company requires about 14 million litres of fuel every year for its approximately 9,000 vehicles. Moreover, it needs some 150 million kWh of energy for the buildings it operates. However, Austrian Post is well on its way to further reducing CO_2 emissions resulting from its business operations, as it did by 27 percent in the period 2008–2012. On balance, the company's business activities emit about 71,000 tonnes of CO_2 each year. However, these greenhouse gas emissions have been fully compensated since 2011 by Austrian Post's support for climate protection projects, so that all letters, parcels and direct mail items in Austria are delivered in a climate-neutral manner. Accordingly, Austrian Post ranks as a trailblazer in the field of 'green logistics' both in Austria and internationally, and in the process also supports its customers in improving their own climate scorecard.[13]

The Osiandersche Buchhandlung (bookshop) delivers internet orders in an environmentally friendly way by bicycle in the German cities of Stuttgart, Frankfurt am Main, Heilbronn, Reutlingen and Tübingen. In 2014 approximately 10,000 units were delivered only in the city of Heilbronn, which is a great contribution to the reduction of CO_2 emissions and traffic congestion. The main idea behind this system however is that pupils and students are delivering books by bike on their way home from school or university to the area of their residential neighbourhood. In Tübingen, for example, the bookshop initiated a student-run company called GreenBooks, which is run by pupils of the Uhlandgymnasium and which won the title 'student-run company of the month' in April 2010, awarded by the chamber of industry and commerce Reutlingen (IHK Reutlingen).[14]

12 The CycleLogistics project is co-funded by the Intelligent Energy - Europe programme of the European Union, and runs from May 2014 until April 2017, accessed June 29, 2015, http://cyclelogistics.eu

13 CO2 neutral delivery by the Austrian Post, accessed June 29, 2015, https://www.post.at/co2neutral

14 The Osiandersche bookstore is a company founded by Christian Friedrich Osiander in South Germany. Headquartered in Tübingen, the company operates in Baden-Württemberg, Rhineland-Palatinate and Bavaria with 29 bookstores and employs more than 400 employees (as of May 2014). Osiander is the oldest bookstore in Baden-Württemberg and one of the ten largest German bookstores.

Future outlook: New concepts have to be invented; new solutions and new organisation must be implemented

Europe's cities continue to grow: 73 percent of Europeans already live in cities, cities generate 85 percent of European GDP, and the level of urbanisation is expected to rise to 82 percent by 2050 (Denmark, Sweden, Belgium, Luxembourg, Malta and The Netherlands expected to have levels of urbanisation over 90 percent by 2050)[15]. A growing urban population combined with other trends (e.g. home delivery, ageing population, e-commerce etc.) will lead to increased density and demand for goods and services – with increasing demand for urban logistics as a consequence.

The 2011 White Paper 'Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system'[16] gave significant attention to urban transport and set the goal of achieving essentially CO_2 free city logistics in major urban centres by 2030.

The 2013 Urban Mobility Package 'Together towards competitive and resource-efficient urban mobility' states in its 'call to action on urban logistics'[17] that without the right vision and stable policy framework it is difficult for operators to see a clear business case for making the investments necessary to implement solutions to existing problems. Clear strategies for the management of urban logistics are needed, particularly at the local level as well as nationally. These strategies need to set out clearly the objectives and the measures that will be implemented to reach them. Implementation needs to be monitored, and plans periodically reviewed and revised. For local decision makers to provide the necessary support and focus, they need a deeper and clearer understanding of the contribution urban logistics makes to the economy. To improve urban logistics in the long term there needs to be better definitions, data collection, monitoring and evaluation. City authorities, regions, logistics operators and businesses have a common interest optimising city logistics, but far too often they operate in isolation and without the necessary co-operation and agreement. Through bringing together local actors and stakeholders, as part of sustainable urban mobility planning, meaningful plans of action can be developed.

A review of best practice in the 'Urban Mobility Packages' call to action on urban logistics' shows that particular attention should be paid to the following areas:

- Manage urban logistics demand: Good land use planning and the widespread use of 'service and delivery plans' can reduce the impacts and cost of urban logistics (for operators and society as a whole) and are particularly important for large sites (e.g. hospitals, office buildings, factories, city centres).

- Shift modes: Urban logistics remains dominated by road transport with conventional vehicles such as lorries or vans. But analysis of freight patterns can identify certain flows (e.g. light short distance or heavy regular flows) that can be more efficiently moved to alternative modes of transport such as bike (25 percent of all urban goods could be delivered by bike), boat or rail.

- Improve efficiency: Urban deliveries are often delayed by road congestion and inadequate loading and unloading facilities which can significantly increase the direct and indirect costs of urban transport, and causing further congestion and environmental consequences. Similarly poorly planned and/or executed urban logistics can cause wider traffic delays e.g. if suitable loading places are not available.

- Improved vehicles and fuels: The operational characteristics of urban logistics can often be suitable for the early introduction of new types of vehicles and operational models (e.g. electric vehicles, off peak deliveries). Improvements in vehicles can make urban logistics quieter, safer, cleaner and more efficient.

15 Together towards competitive and resource-efficient urban mobility, A call to action on urban logistics, 2013
16 White Paper, Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, 2011
17 Together towards competitive and resource-efficient urban mobility, A call to action on urban logistics, 2013

Furthermore, Intelligent Transportation Systems (ITS) are an important tool in urban freight transport with the potential to improve safety, reduce congestion, and increase economic productivity by utilisation of different services, like travel and traffic management, public transportation management, electronic payment, commercial vehicles operations, emergency management, advanced vehicle safety systems, information management, and maintenance and construction management[18].

These systems are characterised by complex architectures, composed of many functionalities and integrating different kinds of technologies and technical solutions. A significant feature of ITS are their modular structure. This makes it possible to implement individual elements in stages, and to concentrate on the ones that are most vital in given conditions. Within each system it is possible to distinguish individual functional subsystems (usually corresponding to the modules referred to above), directly responsible for carrying out specific tasks. The efficient functioning of the whole system depends not only on their direct impacts, but also on cooperation between the subsystems. Thus, ITS are by definition integrated structured systems. However, the cooperation should not be limited only to the local impacts.

As for the range of impacts, ITS may be broken down into three major categories:

- local – operating within a relatively small geographical area, generally a city,
- regional – operating within a subregion, or a region, and
- national – covering the whole country.

The key to their efficient functioning is the integration of individual levels, in accordance with the hierarchy: regional systems integrate with local ones, while the national system connects the individual regional systems to make one integrated structure.[19]

Urban freight optimisation clearly offers a large number of applications for new technologies and concepts. To have liveable and attractive city centres in the future, it is necessary to bring in goods, to have craftsmen working easily, and to facilitate shopkeepers' activities. For example regarding technical aspects, the development of RFID (Radio-frequency identification) technologies will completely change the procedure for transported goods. Products using this technology will be able to act on or react to their travel conditions, for example, by giving an alert in case of damage or incorrect orientation. New modes may be deployed and robotics and automation will also influence freight, making it possible for goods to be transported automatically in specialised networks, at any time, to the right places.

On the organisation side, the private-public-debate will probably find appropriate solutions according to normal practice and legal aspects in each country. But the future operational organisation for urban goods transport is still to be developed; standardisation will contribute, but just like long-distance passenger transport is different from urban transport, there will be specialised companies to handle this aspect of freight movements.[20]

18 Karoń, Mikulski 2011
19 Krzysztof Małecki, Stanisław Iwan, Kinga Kijewska, Influence of Intelligent Transportation Systems on reduction of the environmental negative impact of urban freight transport based on Szczecin example, 1st International Conference Green Cities 2014 – Green Logistics for Greener Cities
20 Breuil, Dotter, Sprunt, CIVITAS thematic leadership programme within CIVITAS II

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