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L 2.1

State of the Art report

"Urban logistics practices"

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Report

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ABSTRACT

Green distribution of goods in the city of Oslo

The objective of the project *Green distribution of goods in the city of Oslo* is to develop solutions for the distribution of goods that are both environmentally friendly and energy efficient. The work package AP2 provides an overview of current projects, city measures or initiatives that have been tested and evaluated around the world. The next step will be to analyse the potential transferability of selected practices to the city of Oslo.
The report highlights measures and initiatives in cities that meet the objectives of the sub activity A2.1 of the project:

- Develop solutions for better use of road spaces
- Develop solutions for better use of day and week time

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Introduction

City authorities are aware of the growing freight traffic and the challenges that it creates for urban dense areas and freight management. They are willing to find solutions for reducing the movements of goods without affecting the economic and business life of the cities (Dablanc, D., 2007 and Crainic, T. G., 2004). This deliverable presents an overview of city practices and initiatives concerning urban freight distribution.
The purpose of this report is to provide a structured review of city initiatives and to highlight involved stakeholders (e.g. city, government, shippers, consignees, carriers, citizens) and benefits. No choice criterion was defined for the selection of city practices in the framework of this project. However the measures must meet the objectives of the sub activity A2.1 of the project, Litteraturstudie om distribusjon av gods i by og energieffektivitet defined as follows:

- Develop solutions for better use of road spaces
- Develop solutions for better use of day and week time

This report provides a snapshot of urban logistics measures, mostly developed in the framework of European projects. The implementation of city measures for better use of road spaces and day time represents a large number of initiatives in the last 10 years. The main focus of European cities today is to develop energy-efficient and sustainable urban freight logistics to reduce energy consumption and greenhouse gas emissions. In the framework of European projects where such state-of-the-art reports were issued, around 100 city good practices are usually reported. Workshops and surveys are organised in order to gather relevant and exhaustive information directly from city authorities.

The greatest part of the information in this report was therefore collected through the websites of international and national projects and European organisations. Valuable information was also compiled through several state-of-the-art reports of recent international projects (e.g. C-LIEGE, SUGAR, TRAILBLAZER, and BESTUFS). However, deliverables and final reports are not always available and some projects are still on-going. Only limited information is available about qualitative and quantitative results and some results may not represent the last findings of some projects (e.g. impact assessment and evaluation). In that case, it is important to note that the attempt to interpret the results of the city initiatives presented in this report must be done with precaution.

Our approach was to organise a reasonable number of around 50 city practices or initiatives in 14 categories to provide a manageable report that remains attractive for the different partners of the Norwegian project. In this context, it was difficult to present a report that can be as exhaustive as a state-of-the-art report of a European project in our set timeframe. An EndNote database was also created to collect research papers about urban freight transport for further research purposes.
The role of the different stakeholders and the methods to be used for the impact assessment and the evaluation of city measures should be identified after a limited selection of measures suited for the city of Oslo. Consequently, the next step will be to identify good practices transferable to the city of Oslo and evaluate requirements and attitudes of stakeholders who could be affected by these measures. Potential gaps for developing these solutions in Oslo may be investigated and contacts must be made with cities to collect more information about their experiences (e.g. benefits, constraints).

1 City logistics practices

The main objective of this report was to identify city logistics practices in term of energy-efficiency and sustainable urban freight transport. To achieve this goal we have collected measures and initiatives from articles, European projects, freight company websites and city network portals.

Most of our references are from the database of the C-Liege project, *Clean Last mile transport and logistics management* conceived in the framework of this project in 2012. Other recent European lists of city practices were also taken in consideration. All these solutions are closely or remotely related to the use of road spaces and day time at different levels.

There are different ways to present city measures and initiatives and to categorise them (e.g. C-LIEGE, SUGAR, TRAILBLAZER, and BESTUFS). Each City initiative has more than one objective and therefore can belong to several categories.
The author of this report has classified the measures with the aim of giving good examples of each sub-category.
Here we propose to divide the urban zone in different spatial layers (inspired from Boudouin, D., 2010).
For each of these spatial layers, the categories of city logistics practices are defined. They have specific functionalities and require public and/or private intervention and special technical equipment.

Urban zone	Urban Logistics plan
	Urban consolidation centre
	Freight Quality Partnership
City centre	Low emission zones
	Access restrictions
	Distribution plan
Street area	Multiple use lane
	Optimisation of routes
	Environmental friendly vehicles
	Intelligent traffic management
Delivery spaces	Delivery times
	Delivery space booking
	Alternative delivery systems

Table 1: Spatial layers of city logistics practices.

Table 2 below presents an overview of city logistics measures classified by categories. These measures meet the objectives of the sub activity A2.1 of the project concerning better use of road spaces and day and week time.
The measures in bold font are presented in this document; the others are cited for further investigations in the case of this category will be taken into consideration for the city of Oslo.

Urban Zone	Measures	Place	Project
Urban Logistics Plan	**Urban Freight delivery Plan**	**Bologna, Italy**	**CIVITAS MIMOSA**
	Strategic extension of city logistics	**La Rochelle, France**	**CIVITAS SUCCESS**
	Mobility Master Plan including freight	Paris, France	
Urban consolidation centre	**Freight Consolidation Scheme**	**Bristol, UK**	**CIVITAS VIVALDI**
	Establishing an urban transhipment centre	**Norwich, UK**	**CIVITAS SMILE**
	Improving City Logistics	**Bremen, Germany**	**CIVITAS VIVALDI**
	Consolidation of deliveries to four Swedish municipalities	**Borlänge, Sweden**	**TRAILBLAZER**
		La Rochelle, France	**ELCIDIS**
	Electric City Distribution Centre	**London, UK**	
	Construction Consolidation Centre	**London, UK**	
	Distribution centres for fresh and perishable goods	Utrecht, Netherlands	CIVITAS MIMOSA
	Consolidation of deliveries	Riga, Latvia	MOSCA
	Local impacts of a new urban consolidation centre – the case of Binnenstadservice.nl	Nijmegen, the Netherlands	
Freight Quality Partnership	**Freight partnership, planning and routing**	**Ploiesti, Romania**	**CIVITAS SUCCESS**
	Developing a strategic freight holders club	**Norwich, UK**	**CIVITAS SMILE**
	Local Freight Networks		**START**
	TransMission	**The Netherlands**	
	Clear zone partnership	London, UK	ConnectedCities
	Efficient goods distribution	Donostia, Spain	CIVITAS ARCHIMEDES
	Efficient goods distribution in lasi	Lasi, Romania	CIVITAS ARCHIMEDES
	Distri-XL	The Netherlands	
	Leicester & Leicestershire Freight Quality Partnership	Leicester, UK	
	Tyne and wear freight quality partnership	Newcastle, UK	
	Van sharing service	Genova, Italy	CIVITAS CARAVEL

City centre	Measures	Place	Project
Low emission zones	**Environmental zone**	**Aaborg, Denmark**	**CIVITAS ARCHIMEDES**
	Creating a new goods distribution scheme	**Burgos, Spain**	**CIVITAS CARAVEL**
	Low emission zone and congestion charging zone	**London, UK**	
	Low emission zone	**Utrecht, The Netherlands**	**TURBLOG_WW**
	Extending the environmental zone	Czech Republic	CIVITAS TRENDSETTER
	Environmental zone for heavy goods vehicle	Gothenburg, Sweden	CIVITAS TELLUS
	Implementing environmental zones	Odense, Denmark	CIVITAS MOBILIS
Access restrictions	**Access Management and Priority Measures**	**Bristol, UK**	**START**
	Access restriction	**Ravenna, Italy**	**START**
	Access restrictions and incentives	**Riga, Latvia**	**START**
	Access restrictions and consolidation of delivery	**Ljubljana, Slovenia**	**START**
	Incentives and access restrictions	**Gothenburg, Sweden**	**START**
	Urban Freight Logistics	**Vitoria-Gasteiz, Spain**	**CIVITAS MODERN**
	Access restrictions for freight vehicles	Brescia, Italy	CIVITAS MODERN
	Freight delivery restrictions	Zagreb, Croatia	CIVITAS ELAN
	Ecologistics	Dublin, Ireland	ECOLOGISTICS
Distribution plan	**Delivery and servicing plan**	**Sutton, UK**	**TRAILBLAZER**
	Policy option for freight distribution schemes	Craiova, Romania	CIVITAS MODERN
	Delivery and service plans	Newcastle, UK	SUGAR
	Delivery servicing Plans	London, UK	London Freight Matters

Street area	Measures	Place	Project
Multiple Use lane	**New concepts for goods distribution** **Priority access for clean goods vehicles**	**Barcelona, Spain** **Norwich, UK**	**CIVITAS SMILE** **CIVITAS SMILE**
Optimization of routes	**Marking Routes for Smooth Freight and City Logistics** Freight partnership, Planning and Routing Clean route planning for freight transport Satellite base traffic management Sustainable freight logistics Software-based urban truck navigation through designated urban truck routes Individual destination maps International Transport and Energy Reduction Action	**Tallinn, Estonia** Ploiesti, Romania Utrecht, Netherlands Malmo, Sweden Ljubljana, Slovenia Ruhr, Germany Newcastle, UK	**CIVITAS MIMOSA** CIVITAS SUCCESS CIVITAS SMILE CIVITAS SMILE CIVITAS ELAN RegLog INTERACTION
Environmentally friendly vehicles	**Petite reine: Final delivery by electric cycle project** **Chronopost: Express freight clean delivery project** **Monoprix Supermarket clean delivery project** **Cargohopper** **New distribution truck** **Environmental-friendly Light Commercial vehicles** **Freight transhipment** **Goods delivery by Cargo Tram**	**Paris, France** **Paris, France** **Paris, France** **Utrecht, The Netherlands** **Lyon, France** **Parma, Italia** **Bath, UK** **Amsterdam**	 **FIDEUS** **ECOLOGISTICS** **CIVITAS RENAISSANCE**
Intelligent traffic management	**Demand management for Goods Vehicle** Intelligent traffic system Intelligent control of traffic lights Urban Freight Energy Efficiency Pilot SMARTFREIGHT	**Bath, UK** Leicester, UK Trondheim, Norway	**CIVITAS RENAISSANCE** CITYLOG FREILOT

Delivery spaces	Measures	Place	Project
Delivery times	**Broadening of loading and unloading times** **Night and off-hours deliveries** **Night deliveries**	**Amsterdam** **Ile de France, France** **Barcelona, Spain**	 **CIVITAS MIRACLES**
Delivery space booking	**Local delivery spaces** **Delivery space booking** Street Management Improvements for loading/unloading Enforcement Lean logistics	**Bordeaux, France** **Bilbao, Spain** Barcelona, Spain	 **FREILOT** CIVITAS SMILE LEAN
Alternative delivery systems	**Freight Bus and delivery van** **BentoBox** **Mobile depot and tricycles** **Packstations** **Slus unmanned warehouse** Encouraging fleet efficiency and home delivery Pipe&Net system for city logistics Consignity	**Lyon, France** **Lyon, France** **Brussels, Belgium** **Germany** **Norway** Winchester, UK Perugia, Italy Paris, France	**CITYLOG** **CITYLOG** **STRAIGHTSOL** CIVITAS MIRACLES CIVITAS RENAISSANCE

Table 2: Green logistics schemes used in cities (mostly based on the C-LIEGE database, 2012)

2 Urban Zone

The transportation of goods constitutes an important activity inside the urban zones by ensuring supplies to stores inside these dense areas. The delivery vehicles make a significant contribution to congestion and environmental nuisances such as emissions and noise (Crainic, T. G., 2004). City awareness is now growing and the authorities are willing to address the environmental issues related to freight transport and traffic, recognizing at the same time the essential contribution of freight transport in the economic and business life of the city. Cities use methodologies to analyse, plan and eventually control freight movement within the city (Crainic, T. G., 2004).

All the city practices presented in this report may be not transferable to the city of Oslo, as the capital of Norway has its own challenges and constraints relating to freight transport. Larger Urban Zones (LUZ) (e.g. London, Paris, Barcelona) launch several initiatives to mitigate pollution and traffic congestion. The potential transferability of practices from one city to another is discussed in the literature (Macário, R. et al., 2008).

2.1 Urban Logistics Plan

Urban freight is now considered as a key factor in city planning and Urban Logistics Plans are promoted by public authorities to take into consideration the goods movements in urban planning. The municipalities, responsible for traffic and transport regulations, adopt a comprehensive approach to the logistics operations in urban areas. Local authorities have at their disposal methodologies and tools to identify the needs of the stakeholders and to analyse the situation of the freight distribution in the city. A scoping study is often required in order to get quantitative freight data (Torrentellé, M., 2012, C-LIEGE). More attention is also given to the conflicting needs between the different stakeholders inside urban areas (Muñuzuri J. et al., 2005). Urban Logistics Plans establish city strategy, adopt solutions according to the different stakeholders' requirements and promote a combination of solutions to take into account several types of issues (Muñuzuri J. et al., 2005). A strong cooperation is therefore needed with as many stakeholders as possible (Transport companies, suppliers, shops, etc) by either creating freight working groups or small-scale freight consortia and partnerships.
The decision to take into account goods movements may however represent for some municipalities a radical change of policy direction (Dablanc, L., 2011. SUGAR). Economic situation and political changes may also affect the implementation of Urban Logistics Plan actions (Torrentellé, M., 2012. C-LIEGE). Information about the solutions that are intended to be implemented and the reasons of their implementation must also be disseminated (e.g. awareness campaigns, city logistics forums) in order to inform all stakeholders and citizens. (Muñuzuri J. et al., 2005)

Two projects concerning urban planning are presented below.

2.1.1 Urban freight delivery plan (Bologna, Italy)

Project: CIVITAS MIMOSA (2008-2012)
Category: organisational – urban planning
Stakeholders: The municipality of Bologna, local and business organisations.
IT support: A common electronic platform (For the municipality and freight operators)

Description: The municipality of Bologna has implemented a freight delivery plan with the support of the project. The activities aim to promote integration of road pricing policies with technological tools to optimise vehicle trips for freight delivery.

Objective:

- Reduce congestion and pollution due to goods delivery in the urban area;
- Rationalise and optimise goods delivery in the city with the goal to decrease the distance covered while maintaining the same level of service; and
- Demonstrate the impact a regulatory intervention in freight distribution can have on congestion and pollution in Bologna.

Method:
The freight delivery plan support actions consisting of three main elements.

- The first is an analysis of freight distribution in the city.
- The second task is to promote the integration of small operator systems to create a shared electronic platform in order to optimise freight delivery.
- The third task is to introduce new access policies to the city centre in order to reduce polluting vehicles.

Benefits: Members of the freight consortium benefit from two electronic parking slot booking models that are currently being tested. They are monitored in real time through innovative technology to check availability and penalize unauthorized parking. The Municipality of Bologna is now trying to follow a French Study aimed at registering and cataloguing the different typologies of pull-in areas located in the city. Thanks to an algorithm, which includes different parameters such as the distance of the pull-in areas from the shops and the number of shops close to the area, this study assigns to every pull-in area a "preference coefficient" that will be used to identify the most useful pull-in areas in Bologna. The first eight pull-in areas identified through this study have been selected to introduce the booking-in-advance option for companies which adhere to the Van Sharing Consortium.

Results: The achieved results are the following:

- 123 journeys carried out through the Van Sharing system;
- 6,300 km covered; and
- Two new operators have joined the Consortium.

Further attempts to involve more operators in the Consortium have unfortunately been unsuccessful.
Results expected:

- A 25 percent reduction in freight vehicle access to the limited traffic zone;
- An average reduction in deliveries of about 10 percent a year;
- Improved availability of parking areas for loading and unloading of goods; and
- An average reduction of the occupation rate of parking spaces for loading and unloading of goods.

2.1.2 Strategic extension of city logistics (La Rochelle, France)

Project: CIVITAS SUCCESS (2005-2009)
Category: organisational - urban planning
Stakeholders: The city of La Rochelle and, local and business organisations.

Description: The city of La Rochelle improved its city logistics plan. The activities aimed to promote the use of clean vehicles.

Objective:

- to improve the efficiency of the city logistics plan and the logistics platform
- to define a methodology for developing a systematic approach to urban goods transportation that could be transferred to other towns in the La Rochelle urban agglomeration.

Method:

The first activity was a detailed analysis of the requirements and attitudes of stakeholders and of relevant measures already being implemented in La Rochelle and elsewhere.
Based on this analysis, the strategic goods distribution plan was drawn up to include:

- identification of the most appropriate locations for access controls for distribution vehicles;
- installation of several specific urban delivery zones, to which retailers will go to collect their packages;
- definition of specific regulations for restricted access zones;
- testing of the new delivery vehicles;
- assessment of pollution impacts; and
- elaboration of a methodology to optimise the development of goods distribution in medium-sized towns based on acquired knowledge.

Results:

- increase the efficiency of goods distribution in the city, leading to a reduction in goods vehicle traffic;
- create secure delivery zones
- create a specific traffic hierarchy and regulation for goods distribution
- reduce emissions through the introduction of clean vehicles
- involve all partners in the search of solutions

2.2 Urban Consolidation Centre (UCC)

Urban Consolidation schemes are logistics measures that city councils develop to consolidate the deliveries and to regulate freight transport in city centres. These centres are developed for delivering goods to private retailers (e.g. shops) or to public organisations (e.g. schools, construction sites).
The main objective of a UCC is to reduce the number of trucks in the city as well as traffic congestion and air pollution.
Public funds permit to start building these schemes thanks to the use of public spaces and/or buildings. City councils often support financially the project whereas a private operator is chosen to manage the freight operations inside the terminal. Other supports such as cleaner vehicles can also be provided by public subsidies.
The success of this type of scheme is strongly dependent on a high participation of retailers and suppliers, retailers asking their suppliers to deliver the consignments to the centre. The more the retailers participate, the more the commercial and economical model improves (SUGAR). In the beginning, the retailers do not need to pay for the use of the centre but public funds are gradually reduced and the retailers have to support a part of the costs. Only the good efficiency of the system encourages the retailers to participate to the scheme (e.g. appropriate management techniques). Strict procedures must be followed to facilitate the deliveries (e.g.

designated waiting places for trucks arriving too early) and the commitment of all business partners is necessary.
City councils have different supporting mechanisms: awareness campaigns, incentive programme, partnerships, and additional services (SUGAR). The results showed that additional services (e.g. management of waste and recycling packages) had to be proposed to make the scheme interesting for carriers. Access control and restriction measures are often adopted to enhance the use of the UCC and cleaner vehicles.

Six projects concerning the use of a consolidation center are presented below.

2.2.1 Freight Consolidation Scheme (Bristol, UK)

Project: CIVITAS VIVALDI (2002–2006) and START
Category: organizational - supply chain management, public infrastructure
Stakeholders: Bristol City Council and retailers in Broadmead. DHL is the operator of the UCC.

Description: The initial step in the development of the consolidation centre was to review the existing freight distribution patterns in Broadmead. In 2003, a survey of retailers in Broadmead was undertaken and a total of 118 surveys were completed using face-to-face interview techniques. The survey data were analysed to provide a list of retailers fitting the consolidation criteria, who would be invited to participate in the trial. The Broadmead freight consolidation centre is located 11 km from the city centre, close to the strategic road network.

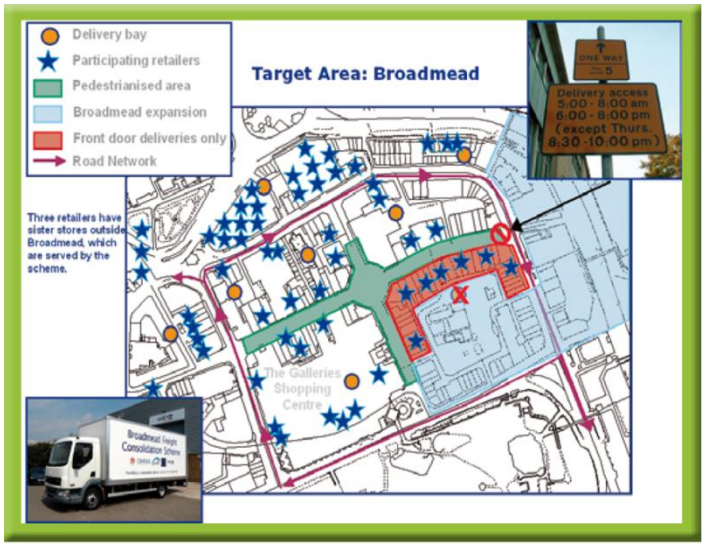

Figure 1: Broadmead shopping area in Bristol. (START)

Objective: The measure was implemented in response to the need to reduce traffic in certain target areas; to reduce conflicts between vehicles in loading areas and delivery bays; to improve air quality in the city centre; to help reduce supply chain costs; and to provide an enhanced delivery service for retailers. The freight consolidation scheme was designed to serve retailers in Bristol's core retail area, Broadmead.

Results: There was a reduction in delivery vehicle movements to participating retailers from the beginning of the scheme. From the third month of operation, the percentage of vehicle reduction remained at over 50 percent. This was due to an increase in the number of retailers joining the scheme, with the increased throughput allowing greater use of the available space within the dedicated consolidation centre delivery trips.

In 2008, 70 retailers were served by the UCC (SUGAR)

- Decreasing by 77 % the delivery vehicles movement. (SUGAR)
- A reduction in emissions of CO_2, NOx and particulate matter was recorded.

The results of the initial phase of the scheme were so positive that Bristol City Council decided to extend the duration of the scheme. The city council and three neighbouring local authorities worked with the freight sector to form the Freight Quality Partnership. This forum has provided a mechanism to discuss innovative freight concepts and the Commercial Vehicle Drivers' Atlas, produced in 2003, was the partnership's first output. The atlas enables freight vehicles to find the most appropriate routes (also bearing in mind height and weight restrictions) for deliveries to business parks and other key destinations in the city.
Method: All the outputs were measured with the MAESTRO indicators. (START)

2.2.2 Establishing an urban transhipment centre (Norwich, UK)

Project: CIVITAS SMILE (2005-2009)
Category: organizational - supply chain management, public infrastructure
Stakeholders: Norfolk County Council and the logistics company Foulger Transport.

Description: Foulger operates a transhipment centre at its Snetterton site, just outside Norwich. Freight operators making deliveries to Norwich via the A11 can deliver to the transhipment centre warehouse, saving time and mileage. Where possible, Foulger combines loads using vehicles already making deliveries to customers in Norwich. Foulger employed a development manager to promote the transhipment centre and engage with businesses to recruit customers. This position was funded by CIVITAS. The first delivery from the transhipment centre was made in October 2007.

Objective:

- Reducing the number of freight vehicle movement in the urban area and the city centre by consolidating deliveries
- Optimising urban goods deliveries and using clean and energy-efficient vehicles can contribute to reducing congestion, emissions and noise in the city centre.

Results: By December 2008, almost 200 initial customer contacts had generated 29 requests for quotations, leading to the recruitment of four customers (three retailers and one industrial customer). Although the measure achieved limited success in terms of customer recruitment, there was a high level of satisfaction with the service among existing customers. There was some success in switching urban deliveries to smaller goods vehicles.
Permitting vehicles making deliveries from the transhipment centre to use a bus lane in the city resulted in an average peak journey time saving of 1.8 minutes, with small related beneficial impacts on fuel consumption and emissions.

2.2.3 Improving city logistics (Bremen, Germany)

Project: CIVITAS VIVALDI (2002–2006)
Category: organisational, supply chain management, public infrastructure
Stakeholders: City of Bremen, a centre operator and carriers
IT support: Logistics software, telematics systems

Objective: to reduce emissions and improve the overall efficiency of goods delivery in Bremen.

Description: The measure focused on the development of efficient urban freight distribution through consolidation systems and logistics software. The overall aim was to reduce emissions and energy consumption by making the distribution of goods to difficult areas, such as the city centre, more competitive than conventional logistics options. The demonstration project was also designed to raise awareness and increase acceptance of low-emissions vehicles in freight transport among carriers and shopkeepers.

Within the VIVALDI project, the objectives were to introduce economic and environmentally friendly trucks running on compressed natural gas (CNG); extend bundled transportation into the city centre; and to develop and apply telematics solutions for the optimisation of logistic flows. Despite great efforts, it was not possible within the project period to purchase any CNG trucks in the planned weight class, as there were none offered by the motor industry. However, City Logistics purchased a bio-diesel truck, partly to assess the economic and ecological impacts and partly to test the new online telematics systems.

Results: Within the project period, units for customers were consolidated each day at the Bremen Freight Village (GVZ) and transported to target areas (shopping centre, central warehouse).
A monthly reduction in truck mileage of about 9,000 km was achieved by City Logistics. This correlates to 70 day-tours by trucks in the 7.5-ton category. A total of 1,100 litres of diesel fuel were saved each month by the grouping, representing a significant reduction in emissions. Ongoing difficult market conditions in relation to the forwarding services, and problems with the planned use of environment-friendly vehicles for city distribution were obstacles to the success of City Logistics in Bremen. The increased efficiency of "conventional" logistics operators and customers' demands for specific delivery times made it harder for the City Logistics operator to be successful under real market conditions without additional subsidies from the public sector.

2.2.4 Consolidation of deliveries to four Swedish municipalities (Börlange, Sweden)

Project: TRAILBLAZER (2011–2013)
Category: organizational - supply chain management**,** public infrastructure
Stakeholders: Municipalities, a centre operator and carriers

Description: The municipality of Borlänge has developed a model of distribution together with three other municipalities, in the county of Dalarna in Sweden. There are ongoing efforts to develop the system and encourage other municipalities in the area to join.
Before the introduction of the system, many trucks were driving through the municipalities to deliver food to individual units. This had the following drawbacks; pollution and too many deliveries to pre-schools and schools resulted in safety risks with trucks reversing in front of the schools.
With the new system of delivery the food is delivered early in the morning, before the staff are at work and also before the children get to school. This is a much safer way of working. The groceries that are ordered by schools, pre-schools, adult social care and kindergartens are now delivered to a distribution centre. There the goods are repacked and delivered to the different units following a pre-defined schedule.

Picture 1: Groceries ready to deliver (TRAILBLAZER)

Results: The total length of the journeys has reduced. The trucks then drive on planned routes to the schools and elderly homes and have decreased the number of stops by 50 – 75% as a result of better planning. The authorities have now opened up for small food producers by splitting the procurement of food and transport. Earlier there were some food suppliers that were dominating the supplies to the municipalities, but today more than 20% of the food comes from regional food producers.

2.2.5 Electric City Distribution Centre (La Rochelle, France)

Project: ELCIDIS (1998 – 2002)
Category: organizational - supply chain management, public infrastructure, access restrictions
Stakeholders: The city of La Rochelle, the chamber of commerce and industry, the French ministry of transport and transport operators.

Description: The operation involved setting up a public urban distribution platform near the city centre, from which electric-powered commercial vehicles deliver and collect parcels. Their design makes them well suited for the narrow streets of the city's historic centre. During the initial phase, only express delivery-type parcels were handled.
The Urban Community provided the terminal manager with premises (some 750 m2), vehicles, handling equipment, computer hardware (not including software), a fast-charge port, and office furniture. To give him incentive for expanding the platform's operations, in terms of both number of consignors and auxiliary services, it was also decided that the first transport operator (Transports Genty) would be remunerated on the basis of the number of parcels handled on the platform (pick-up and delivery). Four employees work at the terminal (SUGAR).
The terminal platform manages two types of activities: delivery of parcels handed over by consignors and auxiliary services. The main auxiliary services are storage for staggered delivery to shop owners, and business-to-business or business-to-consumer deliveries.

Picture 2: Urban Consolidation in France. La Rochelle (Thévenon, 2010)

Objective: ELCIDIS was designed not only to promote delivery in electric vehicles, but also to relieve traffic congestion in the centre by reorganising deliveries. Heavy freight-delivery vehicles (i.e. GVW exceeding 3.5 T) are only allowed to deliver within the perimeter between 6 and 7:30 a.m and these deliveries have to be subcontracted to the terminal operator.

Results: The carriers' viewpoint was polled in several interviews:

- the platform is accessible and well-situated,
- operation is considered the same as for any other platform,
- relations with terminal staff are very satisfactory,
- the time saved per day and per lorry is estimated at 3 hours,
- by eliminating the stress of centre-city delivery, working conditions have improved,
- the service provided by terminal personnel is considered as good,
- no complaint was registered on the part of shopkeepers.

The transport operators perceive the costs as too high. Today, the city of La Rochelle has stopped providing subsidies. The terminal operator went bankrupt and the new organization (VEOLIA) has not yet been evaluated. As for the shop owners: 58% of the businesses located in the restricted area received deliveries via the consolidation centre.
What is their perception of ELCIDIS:

- very high quality service by delivery personnel,
- substantial reduction in noise observed,
- noticeable decrease in delivery related traffic congestion,
- set-up fitting the requirements of the city centre.

Some noted, however, that the vehicles were not suitable for certain types of goods delivery (e.g. clothes on hangers).

2.2.6 Construction Consolidation Centre (London, UK)

Project: London Construction Consolidation Centre (2005-2007) and a new facility was opened in 2008 without the participation of Transport for London.
Category: organizational - supply chain management, public infrastructure

Stakeholders: suppliers of construction materials, commercial and business companies, Transport of London for creating the team involved in the management of the centre

Description: The London Construction Consolidation Centre (LCCC) acted as a distribution centre and delivery service area for construction materials to four major building projects in Central London. The Consolidation Centre operated between 07:30 and 17:30 from Monday to Thursday and 07:30 to 16:00 on Friday with 24 hour operation available if required (Freight Best Practice, Transport for London). 16 employees worked at the consolidation centre.
The LCCC is part of the Delivery and Servicing Plans, one of the key projects of the London Freight Plan (2004).

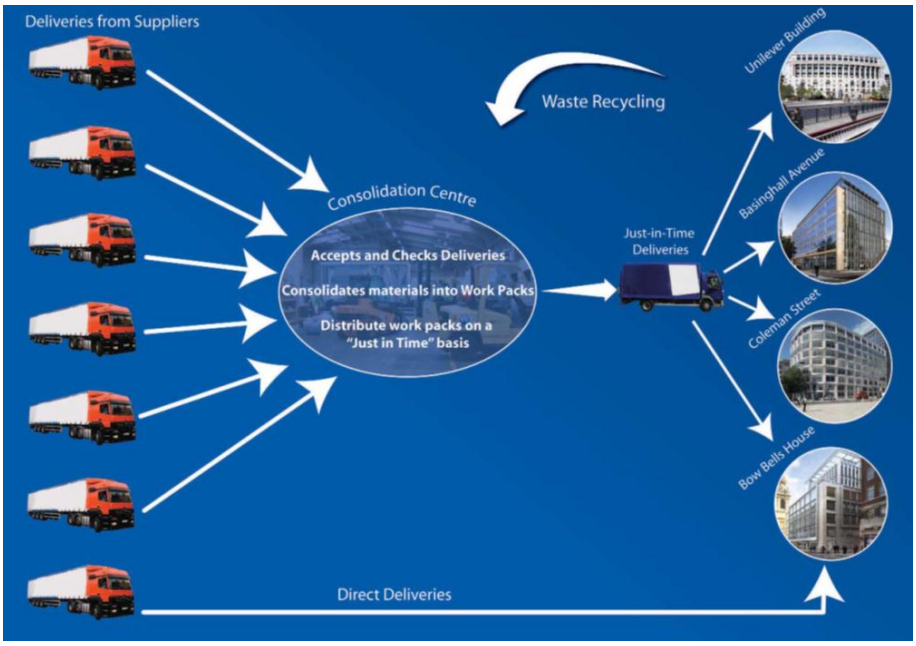

Figure 2: Construction Consolidation Centre (Freight Best Practice, Transport for London)

Objective: to deliver in the safest and most efficient way the materials to the construction sites by reducing environmental impacts and the number of vehicles in the urban area.

Results: The following environmental and economic benefits have been achieved (Freight Best Practice, Transport for London):

- Reduced CO_2 - an estimated reduction of 70-80 % CO_2 emissions
- Congestion - a 70% decrease in the number of delivery vehicles travelling to the construction sites including the removal of deliveries by articulated lorries
- Improved service levels - fewer failed and late deliveries as the LCCC manages the final delivery stage
- Greater delivery flexibility - companies ordered smaller quantities for each site while suppliers sent full loads to the LCCC
- Fewer unnecessarily early deliveries – without a consolidation centre, deliveries from further afield would generally arrive early to avoid late delivery penalties. This leads to certain logistical problems including:
  - Trucks waiting to be unloaded at site, causing local congestion issues
  - Deliveries being tipped and product sitting around on site before required
  - Deliveries being turned away altogether

As well as delivering to the construction sites, the vehicles were bringing recycling packages and unused materials back to the LCCC to be recycled or returned.

2.3 Freight Quality Partnership

Freight Quality Partnerships are collaborative networks between freight partners. The objective is to optimize freight transport by working together on logistics operation issues, exchanging information and experiences and developing a common freight strategy. The implementation process includes identifying the target group and their different needs, developing a communication platform, and using dedicated specific city measures (e.g. use of priority lanes).

Four examples of partnerships from projects and private business initiatives are presented below.

2.3.1 Freight partnership, planning and routing (Ploiesti, Romania)

Project: CIVITAS SUCCESS (2005-2009)
Category: organizational - supply chain management, access restrictions
Stakeholders: carriers, logistics operators
IT support: Freight forum

Description: Ploiesti's strategic logistics plan was a first step towards restricting the access of heavy goods vehicles to the city centre and finding alternative routes for goods delivery. Ploiesti aimed to encourage a cooperative approach among stakeholders in order to optimise transport and delivery networks.
The implementation of the measure required:

- the elaboration of a strategic logistics plan for the city;
- the design of facilities dedicated to goods distribution;
- the identification of freight routes; and
- the establishment of a freight forum, as a highly effective way of bringing together stakeholders to identify issues and find solutions.

Objective: Promote cooperation between operators; improve signing; encourage best practice

Results: Freight routes were defined and signposted. As a result, access by heavy goods vehicles to the city centre was completely restricted and heavy traffic was instead directed to the large commercial area on the outskirts of the city. Levels of congestion, pollution and noise inside the city were lowered.

2.3.2 Developing a strategic freight holders club (Norwich, UK)

Project: CIVITAS SMILE (2005-2009)
Category: organizational - supply chain management
Stakeholders: private sector haulage, logistics and freight distributors and local authorities

Description: This measure aimed to establish a freight stakeholder group that could work together to develop a strategic freight initiative in the Norwich urban area. It attempted to involve key private sector haulage, logistics and freight distributors and the local authorities to establish delivery and collection needs

and identify where these could be combined and made more efficient, resulting in a reduced number of trips, reduced vehicle emissions and lower fuel consumption.

Objectives:

- Seek agreement of logistic companies to participate in the Stakeholders Club,
- Seek agreement and participation of retailers and manufacturers served by the logistic companies participating in the club,
- Promote meetings between urban freight providers, users and local authorities,
- To ensure that vehicles entering the city central core are suitable for use on the constrained road network,
- Promote information exchange between operators.

Method:

Task 1: Undertook initial enquiries with freight operators serving Norwich to identify their willingness to join stakeholder group.

Task 2: Established strategic freight stakeholder group.

Task 3: Attempted to work with strategic freight stakeholder group to identify areas where the results of the integration of resources could be demonstrated.

Results: There was only limited interest from operators in forming a stakeholders group. It was also difficult to encourage those who did express an interest in forming a club to attend any regular working group meetings. Instead, it was possible to ask interested operators to contribute to strategies and consultation work as and when required.

2.3.3 Local freight network

Project: START (2006-2009)
Category: organisational, supply chain management, urban planning
Stakeholders: freight partners and local authorities

Description: The Local freight networks have been involved in the planning of the integrated package of demonstration measures in the START cities.

Bristol and Göteborg are examples:

Bristol established a local freight network in 2003, which took the form of a Freight Quality Partnership (FQP). Bristol's freight network involves some 17 organisations including 4 neighbouring local authorities, a range of stakeholders and interest groups and hauliers and retailers. The network meets two or three times a year to discuss a variety of issues ranging from the FQP's own annual report and action plan to implementing freight initiatives and providing input for wider policy objectives.

Göteborg: To get the support and input from the transport business, the Traffic and Public Transport Authority together with the Swedish Road Haulage Association formed a Local freight network in 2006. Göteborg has put efforts in involving participants from different parts of the transport chain. The network has half-day meetings, four times a year. The Traffic and Public Transport Authority together with the Haulage Association set up the agenda and host the meetings.

2.3.4 TransMission (The Netherlands)

Description: Collaborative networks and cross-docked delivery
Category: organisational - supply chain management,
Stakeholders: 17 transport and distribution companies, 1,100 employees (status 29.03.2012)
IT support: TMS software platform

Objective: The transport and distribution companies within the TransMission group work under one name. The objective for carriers was to create a fully covering network with at least one central hub and direct exchanges between partners. It provides customised logistics with fixed route transport and network distribution from one service provider. All goods that are suited for the collaborative network, the Less-than-truckload, are transported to the central hub and during the night all deliveries are cross-docked between the partners. (Quak, 2012)
The TMS system supports the entire set of activities and all the members use the same software for tracing and tracking the goods. The system contains automatic route planners that determine the order routes. Shipments are sorted and load factors increased. (Quak, 2012)

Results: The collaboration results in more sustainable and efficient urban freight transport operations.
- Without this collaboration, deliveries covered by the partners would require four times more trucks.
- Transport from and to the hub is done in down-peak periods (i.e. nights)

3 City centre

The city centres are congested and the population living in these urban areas face high noise and pollution levels. Different urban measures are developed by the city authorities in order to reduce the number of polluting vehicles entering in the cities: e.g. delimitation of a low emission zone with freight access restrictions, improvement of inner city logistics and distribution plan.

3.1 Low emission zones

Low emission zones are implemented to meet low emission levels in a defined zone where the population is dense. The key factors of measures concerning the implementation and extension of environmental zones are:

- the geographical delimitation of the zone
- Access times to the zone
- the vehicles allowed in the zone and the emission standards required
- Enforcement measures

Four projects concerning the implementation of low emission zones are presented below.

3.1.1 Environmental zone (Aalborg, Denmark)

Project: CIVITAS ARCHIMEDES (2008-2012)
Category: organisational, access restrictions
Stakeholders: freight partners and public authorities

Description: Aalborg's environmental zone requires minimum standards for HGVs (heavier than 3.5 tonnes) and vans. Legislation for environmental zones in the major Danish cities was approved in January 2007. In many Danish cities, weak relations with freight operators pose obstacles. Freight operators in Aalborg share a favourable attitude towards limiting heavy traffic in the city centre because of their positive experience with previous projects. The city implemented an environmental zone in 2009.
Only heavy goods vehicles and busses (>3.5 tonnes) that comply with the required Euro 3 standards were from 2009 on allowed to drive in the zone. Danish vehicles were required to have a low-emission zone label on the windscreen, international HGVs needed to provide vehicle documentation. The restrictions were generally accepted by freight companies, which is mainly due to the good communication and early involvement of the companies. In January 2009, signs were mounted at the entrances and exits of the zone. Promotion material such as leaflets, posters and the website informed involved target groups.
From July 2010 heavy goods vehicles and busses had to fulfill the Euro 4 standards to drive in the zone. To communicate these changes, an information campaign for the freight operators took place in the spring and summer. New requirements for foreign freight and bus transport were implemented in October 2011: Lorries and buses from other countries had to have an environmental zone sticker and meet the requirements.

Objective: The main objective of the measure is to minimise negative environmental impacts from freight transport in the city centre. An analysis from 2005 showed that such an environmental zone will reduce CO, HC and NOx emissions from HGVs by 25 percent and PM emissions by 20 percent. For vans, emission reductions will vary between 30 and 60 percent.

Results: In October 2010, a license plate registration took place on all access roads to the environmental zone. The results of the registrations were that the share of lorries with Euro IV or newer had increased from 28% in 2008 to 54% in 2010. From November 2010 until January 2011 the city of Aalborg provided data (traffic counts and traffic data) for air quality modeling for the National Environmental Research Institute. Aalborg expects that the measure will result in lower levels of pollution in the city centre.

3.1.2 Creating a new goods distribution scheme (Burgos, Spain)

Project: CIVITAS CARAVEL (2005-2009)
Category: organizational, supply chain management, access restrictions
Stakeholders: the city of Burgos, freight partners

Description: In Burgos, goods stored in numerous central warehouses outside the city were distributed daily using small vans that circulated through the city centre. This gave rise to a number of problems:

- the number of delivery vehicles circulating throughout the city, including the historical centre,
- congestion problems,
- the presence of large, noisy delivery vehicles during working hours in pedestrian zones,
- double parking during loading and unloading ,
- illegal occupancy of reserved delivery bays,

Objective: The measure was therefore aimed at more environmentally friendly goods delivery by limiting access to clean zones in the city centre. The use of cleaner vehicles was also promoted by actively encouraging delivery companies to gradually replace their fleets with vehicles conforming to Euro IV standards.

Method:
Activities included:

- optimisation of logistics in the "clean zone",

- dedicated parking zones around the “clean zone” for loading and unloading,
- a new freight logistics centre,
- analysis of the situation and level of involvement of distributors, logistics services and industries,
- analysis of social and economic feasibility and satisfactory layout for the new goods distribution system,
- introduction of cleaner vehicles for goods delivery in the “clean zone”,
- implementation of public information campaigns to promote new goods distribution strategies and win public acceptance,
- organisation of training workshops for police officers,
- training for system operators.

Results: The measure was implemented in relation to the new access restriction scheme designed by Burgos city council to offer the public more open, pedestrianised spaces free from traffic, pollution and noise. It was also linked to the development of a new freight distribution centre using cleaner electric vehicles. An agreement was signed with goods distribution companies to arrange delivery timetables, and entry into the restricted access area was limited to electric vehicles and bicycles belonging to the goods distribution system. The results were:

- Fewer vans and lorries crossing sensitive city-centre areas.
- Support from more than 88 percent of citizens.
- Support from more than 90 percent of goods distribution companies for the new system and the new freight distribution centre.
- Good transference of results from Genoa and other cities.
- Involvement of stakeholders throughout the implementation process.

3.1.3 Low emission Zone and congestion charging zone (London, UK)

Category: access restrictions, technical

Description:
The Low Emission Zone (LEZ) was introduced in 2008 to encourage the most polluting heavy diesel vehicles driving in the Capital to become cleaner. The LEZ covers most of Greater London and operates 24 hours a day, every day of the year including weekends and public and Bank Holidays. To drive within it without paying a daily charge, these vehicles must meet certain emissions standards that limit the amount of particulate matter (a type of pollution) coming from their exhausts. Charging days run from midnight to midnight. (Transport for London)
Despite significant improvements in recent years, London's air pollution is still a concern. In 2012, the LEZ emissions standards became more stringent. More vehicles are affected, and those that were already affected need to meet tighter emissions standards. There are no barriers or tollbooths within the Low Emission Zone (LEZ). Instead Cameras read number plates and check them in the database of registered vehicles. The database automatically tells whether the vehicle meets the LEZ emissions standards, is exempt, is registered for a discount or if the daily charge has already been paid. (Transport for London)

Picture 3: London LEZ road signs

The LEZ is not the same as the central London Congestion Charging zone. The Congestion Charge applies from 7:00am to 6:00pm Monday-Friday, excluding public and Bank Holidays. If driving within the Congestion Charging zone during these times transporters have to pay the Congestion Charge, even if the vehicles meet the LEZ emissions standards or the LEZ daily charge is paid. (Transport for London)

3.1.4 Low Emission Zone (Utrecht, the Netherlands)

Project: TURBLOG (2009-2011)
Category: access restrictions
Stakeholders: The Municipality of Utrecht and the logistics companies.

Description: In July 2007 Utrecht introduced an environmental zone in the inner-city of Utrecht. The objective of the environmental zone is to ban out lorries that cause heavy pollution in the city centre, and to encourage the substitution of a cleaner generation of lorries or the installation of soot filters.
The Low Emission Zone (LEZ) is operational in the area around the train station and some roads in the neighborhood. Currently only Euro 4 and 5 trucks are allowed in the environmental zone and Euro 3 trucks are only allowed under special conditions (with soot filters and if not more than 8 years old).

Results:

- More costs for the logistics companies: approximately €10,000 per vehicle;
- More costs for the Municipality: cameras (€0,5 - €0,8 million in 5 years), traffic signs (55-60 locations), communication costs (approximately €10,000) and capacity costs for the requests of single access permits (1,000-5,000 single access permits per year);
- Less traffic incidents and higher life quality for citizens and the city;
- Less pollution.

3.2 Access restrictions

Access restrictions are city measures now widespread in Europe; they are related to regulations for vehicles, regulations for access time windows, regulations for routes and lane priority, and regulations based on licences (C-LIEGE).

Six city practices concerning access restrictions and incentives are presented below.

3.2.1 Access Management and Priority Measures (Bristol, UK)

Project: START (2006-2009)

Category: organisational - access restrictions, incentives
Stakeholders: Bristol City Council, DHL Exel Supply Chain.

Description: The Broadmead shopping centre in Bristol receives 90,000 delivery vehicles per year contributing to congestion, traffic related air pollution and vehicle conflict in loading areas. Bristol City Council in partnership with supply chain experts, DHL Exel, have been successfully operating a consolidation centre. (See Freight Consolidation Scheme (Bristol, UK))
The measures comprised:

- The Consolidation scheme
- Access delivery times
- Incentives: eco-driving training and priority lane for consolidation vehicles

For the main pedestrian area of Broadmead a delivery window has been put in place notably 5am – 8am. For the new Quakers Friars Pedestrian area this window is 5:00 – 10:00am. Potential access restrictions are being developed, focusing not only on general traffic accessing the Broadmead area, but more specifically on freight movements within the area.

Objective: The project sought to prioritize freight vehicles movement and introduce access control measures. The emphasis lies on promoting the use of the consolidation centre to support the business case and thus providing priority access for consolidation vehicles (electric vehicles). Allowing consolidation vehicles to use the bus lane will shorten journey times and improve journey time reliability making the scheme more attractive to both stakeholders and retailers.

Picture 4: Consolidation vehicle in Bristol, UK. (START)

Results:

- Reducing vehicle movement and pollution
- New pedestrian area

This has raised a number of issues between retailers and their suppliers with the beneficiary being the Bristol consolidation scheme as they are able to offer an improved delivery option to retailers. The restrictions resulted in 15 new retailers subsequently joining the scheme and the city council reached the objective of reducing pollution and creating a new pedestrian area.
The implementation of a 3km priority lane resulted in a 78% reduction of vehicle movement among the participating companies and reducing delivery trips to the Broadmead area by 23%, and in the process helped cleaning the environment by eliminating around 30% of CO_2, NOx and PM10 emissions (ISIS). Retailers

also have waste and packaging material collected which has meant 17.1t of cardboard and plastic being recycled.
Method: Outputs measured with the MAESTRO indicators (see Evaluation Plan, START).

3.2.2 Access restriction (Ravenna, Italy)

Project: START (2006-2009)
Category: organisational, technical - access restrictions, incentives, ITS system
Stakeholders: The municipality of Ravenna, ITL (Non-profit foundation operating in the field of transport and logistics), CONSAR (Transport company), The region Emilia Romagna

Description: The political orientation towards urban goods delivery complies with the broader vision of a city that strives to control, and if possible reduce, air pollution and energy consumption.
The measures comprised:

- Urban traffic Plan: Access and Park in city centre
- Incentive programme for clean vehicles and financial support for the renewal of fleets
- Control Centre with TCM system to control and enforce access restrictions
- Access time windows to Limited Traffic Zone (LTZ)
- Parking disk for loading areas

LTZ access restriction is composed of two parts: In one there are restrictions to vehicular traffic from 0:00 to 24:00, all days, including Sundays, in the other part the restrictions apply from 7:30 to 20:30 every day, including Sundays. Loading and unloading operations are allowed as follows: 8:30-10:30, 14:30-16:00 and 0:00-7:00. In loading/un-loading areas, vehicles are allowed to stop for a maximum of 30 minutes with the obligation to show the parking disk. The municipality has implemented an ITS system, SIRIO for the respect of city centre access by recognition of plate numbers.

Objective: the objective consists in reduction of vans/trucks during the time windows most preferred by tourists, the reduction of illegality in parking by loading/unloading vehicles and stimulating a more efficient urban delivery system by increasing load factors and using cleaner vehicles.

Results:

- Development of the local freight network
- General Urban traffic Plan
- Enlargement of the clean commercial fleet by promotion of the renewal of vehicles of every company operating in Ravenna and by setting up of appropriate incentive programme.
- Increased number of clean vehicles by 3.925 (3761 private, 24 taxis, 40 artisans, 100 commercial vehicles).
- Improvement of freight distribution. Reduced number of trips.

3.2.3 Access restrictions and incentives (Riga, Latvia)

Project: START (2006-2009)
Category: organisational, technical - access restrictions
Stakeholders: SIA “Rigas satiksme” (Public transport company), Riga City Council City Development Department, Latvian Traders Association, SIA “Environment Management Coordination Centre”, Riga Municipal Police Centre District Department, Riga City Council Environmental Department, Road Traffic Safety Directorate.

Description: There is a high concentration of public and economic activities in the historical centre. It is the most sensitive zone with severe traffic problems such as traffic jams, lack of parking lots, high air pollution.

Objective: Implementation of traffic restrictions and identification of goods delivery drop-off points to improve traffic flows, environment quality and increase transport efficiency for goods delivery.
The measure comprised:

- Consolidation scheme
- Development of drop-off sites
- Access restrictions for freight vehicles on peak hours

The vehicles with a total weight exceeding 5t are restricted on several bridges and access roads of the city at peak hours (4pm to 7pm) during weekdays.

Results:

- Consolidation scheme – local freight network
- Recommendations for further development
- Consolidation of goods deliveries
- Map of drop-off sites
- A 9 % reduction of trips and a decrease of emissions between 3% and 9 % estimated

Method: Outputs measured with the MAESTRO indicators (see Evaluation Plan, START).

3.2.4 Access restrictions and consolidation of delivery (Ljubljana, Slovenia)

Project: START (2006-2009)
Category: organisational, technical - access restrictions
Partners: City of Ljubljana, Prometni Institut Ljubjana
Technical support: Access control via radio emitting devices or smart card reader.

Description: In the City's Program of environmental protection, a great concern is given to traffic as an important polluter of air and an inducer of other emissions. The freight transport contributes quite significantly to these emissions. Ljubljana implemented access restrictions for heavy freight transport in the year 2000. Only in the city centre is there total restriction for all vehicles exceeding 3,5t. In the broader city area there is a restriction for all vehicles exceeding 7,5t during peak hours.

Picture 5: Rising bollards for access restrictions in Ljubjana, Slovenia. (START)

Objective: The main goal is to develop new solutions to improve the organization of goods distribution by identifying acceptable measures of access restrictions and incentives as well as possibilities for optimization of freight transport and distribution centres.
The measure comprised:

- Consolidation scheme - Local freight network
- Development of a model for access restrictions and freight deliveries
- Limited access areas - Implementation of physical barriers ("rising bollards")

Results:

- Reduced trips and emissions
- Guarantees the enforcement of time windows and access policies
- Allow pedestrian zones

Calculations show that the adoption of the small consolidation scheme servicing the historical centre would reduce trips by 15% and emissions by 20% (C-LIEGE project).

3.2.5 Incentives and access restrictions (Gothenburg, Sweden)

Project: START (2006-2009)
Category: organisational – public infrastructure, access restrictions, incentives
Partners: City of Göteborg, Traffic & Public Transport Authority, Swedish Road Haulage Association

Description: Göteborg, as the second largest city in Sweden and as a transport hub with the biggest harbour in the Nordic region, is facing a continuous increase of transport in general and of freight transport in particular.

Objective: The City of Göteborg has implemented a pilot project in parts of the city centre to study whether incentives combined with restriction in a project on a voluntary basis can be a way of getting the deliveries within the city more efficiently.

Picture 6: Consolidation vehicle in Göteborg, Sweden. (START)

The measure comprised:

- Incentives tested for high load factor and clean vehicle: removal of one way direction, access to loading zones and bus lanes
- Stricter and better enforcement of time windows

The Pilot project was tested and evaluated in an inner-city zone with three new areas identified for load factor restriction implementation. The restrictions would be implemented in parallel with a number of incentives developed in cooperation with the transport business. The pilot project was run with 46 participating vehicles from 7 companies. To access different parts of the centre the weight or volume load rate in the vehicles had to be over 65 % or the company had to have 50 customer deliveries. As incentives for increasing the load rate, the participating companies had access to 13 special loading zones and bus lanes in the city centre. The project was carried out according to plan, but the results were not as expected. After one year many of the companies had left the project since they could not fulfill the load factor demands and/or reporting obligations. The incentives that were offered within the scheme were not efficient enough to increase the load factor. A new scheme of strict enforced time windows was implemented in the inner city area of Göteborg. The time windows restrict heavy-duty vehicles accessing the streets between 11 am and 12 pm. Vehicles other than distribution vehicles are no longer permitted to drive on the streets.

Results: One-way direction removed in two places in Göteborg inner-city, resulting in time and distance savings for delivery vehicles. Implementation of strict enforced time windows in the inner-city zone resulting in a 50% reduction of the total number of vehicles in the area.

- Establishment of Local freight network with 15-20 participants.
- Implementation of time windows and removal of one way road signs in the inner-city area in combination with new pedestrian streets led to a reduction of parked vehicles in the area by 82% and a reduction of pass-through vehicles by 73%.
- Implementation of a consolidation centre in the Lindholmen area, leading to a reduction of CO_2 emissions: -51%, NOx emissions: -50%, PM10: -50%, vehicle km: -50%, no of trips: -50% in the demonstration area.
- 30 companies/organisations involved in the local demonstration measures.

3.2.6 Urban Freight Logistics (Vitoria-Gasteiz, Spain)

Project: CIVITAS MODERN (2008-2012)
Category: organisational, technical - public infrastructure, access restrictions, incentives
Stakeholders: the municipality of Vitoria-Gasteiz and transport operators

Description: The measure is based on a policy of multi-use lanes, urban distribution centres (UDC) new regulations, routing and scheduling scenarios. Vitoria-Gasteiz proposed that UDCs operate as consolidation warehouses and distribution centres. They are located underground at strategic points that allow for short-distance distribution. Some underground spaces are parking spaces.
The distribution from these centres can be carried out during times of low traffic density during the day or at night with energy-efficient vehicles. Night distribution of goods by specially-designed vehicles can be appropriate for certain trips such as for deliveries to big supermarkets in the city centre. Night-time on-street parking spaces will be transformed into loading and unloading zones during low-traffic hours at daytime, while the lane will be used as a priority bus lane during peak times.

Objective: Vitoria-Gasteiz is looking at developing a new framework for urban freight logistics that averts disruptions from goods distribution. Vitoria-Gasteiz works closely with freight delivery companies to make sure that the new urban freight framework is an efficient way to manage the distribution of goods.
The main objectives of the measure are to:

- Free up and improve the quality of public space;

- Avoid disruptions in pedestrian areas through freight deliveries; and
- Reduce noise and pollutant emissions

Results expected:
- An increase in freed up public space for social and neighbourhood relations; and
- More efficient freight logistics in the pilot areas.

3.3 Distribution plan

A distribution plan is a strategic solution to organise freight transport. It is based more on companies' cooperation rather than on access restrictions and charges. The initiative is taken and organized by city councils.

One delivery and servicing plan was chosen to be presented below.

3.3.1 Delivery and servicing plan (Sutton, UK)

Project: TRAILBLAZER (2010-2013)
Category: organizational, administrative
Stakeholders: Sutton council and private organisations

Description: The Delivery and Servicing plan (DSP) toolkit from the TRAILBLAZER project provides a generic framework for creating a Delivery and Servicing Plan. A DSP outlines how a public or private sector organization deals with its need to generate freight transport efficiently, safely and in a sustainable way. The plan focuses on different activities including goods collection and delivery, waste and recycling and servicing activities such as office maintenance.

Objective: a DSP aims at increasing the efficiency of the freight transport systems in urban areas. The plan has an impact on reducing CO_2 emissions, congestion and improving air quality.

Sutton Council established a DSP working group. The detail actions were to achieve one of the council's travel plan objectives: to minimize the negative impacts of servicing and deliveries associated with the council's main sites. The plan has links with the council's Eco-Management and Audit Scheme (EMAS), which seeks to reduce the Council's environmental impact. Actions defined in the DSP will be integrated into teams' EMAS action plans through which their progress will be monitored, audited and reported. The council recognises the importance of implementing an exemplary DSP as an example for other organisations in the borough, and beyond, to benefit from.

Results expected:
- Reduction in the CO_2 emissions generated by council activity
- Reduction in air pollution emissions such as PM10s and NO_2
- Contribution to reducing congestion and personal injury accidents
- Improved efficiency and potential financial savings
- Reduced risk of illegal kerbside activity
- Improved efficiency for council activity.

4 Street area

To reduce the negative effects of increasing freight traffic, the municipalities implement new concepts in the management of street areas.

4.1 Multiple Use lane

To enhance the use of cleaner vehicles and to reduce their travel times inside the city, new concepts are adopted to authorise these delivery vehicles to use the bus lanes at certain times.

Two examples of city measures concerning the use of bus lanes by clean delivery vehicles are presented below.

4.1.1 New concepts for good distribution (Barcelona, Spain)

Project: CIVITAS SMILE (2002-2006)
Category: organisational, technical, infrastructural - urban planning, supply chain management
Stakeholders: the municipality of Barcelona and carriers
TMS support: Digital display screens provide web-based information on lane priorities.

Description: Barcelona has implemented an innovative measure using information technologies to manage multiple use lanes. Depending on the time of the day, these lanes served as public parking spaces, load zones or bus lanes, and the corresponding information was displayed on screens (Muñuzuri, 2011). The introduction of multi-use lanes in Barcelona extends the total length of lanes and converts on-street parking spaces into unloading spaces between peak hours. During peak hours, the lanes are used as priority bus lanes.

Picture 7: Variable message for use of bus lane in Barcelona (CIVITAS SMILE and Wild, D., 2008)

Results: The measures have resulted in the elimination of illegal parking by residents. During the hours that the lane is dedicated to loading/unloading the goods delivery vehicles can always find a place to park – double parking no longer occurs. As a result of the improved discipline in lane usage, junction capacity along Balmes is optimised during peak hours and the levels of saturation have been reduced with a corresponding improvement in traffic circulation. The VMS signals are highly visible and this has contributed to the overall success of the scheme.
This system suffered from enforcement problems, since exceeding the allowed period, or double parking, was found to be rather common (Muñuzuri, 2011). The municipality observed improved circulation speeds following the launch of the multi-use lane scheme. The measure is being extended along other primary roads.

4.1.2 Priority access for clean goods vehicles (Norwich, UK)

Project: CIVITAS SMILE (2005-2009)
Category: organizational, infrastructural - urban planning, access restriction
Stakeholders: Norfolk County Council and carriers

Description: Norwich is a relatively compact urban area with a radial pattern of main road corridors. The city's core commercial and retail area is located within the inner ring road where there is a weight restriction at all times, although an exemption is permitted for loading and unloading. Prior to measure implementation, goods vehicles were not allowed to use transport priority lanes and there was no urban consolidation centre.

Objective:
The aim of the measure was to allow goods vehicles that met a pre-determined clean vehicle standards to use transport priority lanes.

- Sharing of priority collective transport priority lanes to freight operators who respect clean urban transport principles.
- Increase the proportion of urban goods vehicle transport, which meets pre-determined emission control standards.
- Work in partnership with operators who respect clean urban transport principles in order to facilitate their journeys in the Norwich area and to mitigate the negative effects of urban freight transport on other network users.

Method:
A select group of low emission lorries heading into Norwich were allowed to use a bus-cycle lane in Newmarket road during congested periods as part of a move to cut freight deliveries into the city. Only heavy goods vehicles out of the Norwich freight consolidation centre were allowed to use the bus lane. Vehicles using the lanes were low emission engines and vehicles running only on locally produced bio-fuels. The number of delivery vehicles using the bus lane was limited approx. 2 to 5 times a day. Drivers were given training on how to drive when in the bus lane. A six-month experiment permitted lorries to use the bus-cycle lane in Newmarket Road and the route through Castle Meadow and Red Lion Street during the morning and evening peak periods. Feedback from the experiment was monitored as part of a consultation to gauge how successful it has been.

Results:
The key findings were as follows:

- The width of the existing bus lanes was a barrier to implementing the measure, thus revised objectives were developed so that only consolidation centre vehicles could use the bus lanes.
- The number of heavy goods vehicles using the bus lanes was about one per day, due to the number of customers using the consolidation centre. As the number of customers using the consolidation centre increases, the number of bus lanes users will rise.
- There was some stakeholder opposition to the measure.
- Monitoring showed a peak-time journey saving of two to four minutes per trip for an overall average journey of 25 minutes. This equates to small savings in emissions and fuel consumption. There was little benefit from using the bus lane at off-peak times.

4.2 Optimisation of routes

The planning of freight routing requires a cost-effective transport service with on-time guaranteed deliveries, meeting as well the city access restrictions (Lin, C.C., 2001). In most cities, freight vehicles are only allowed in defined routes and corridors. The drivers can be informed by municipalities by different communication flow solutions and dynamic road signs can be displayed along the roads to guide the drivers through the city.

An example is presented below.

4.2.1 Marking routes for smooth freight and city logistics (Tallinn, Estonia)

Project: CIVITAS MIMOSA (2008-2012)

Category: organizational, technical, infrastructural - urban planning, access restriction
Stakeholders: The municipalities and carriers
Technical support: GPS system

Description: Tallinn planned to define freight traffic corridors in the city centre, mark them and install traffic signs to guide freight vehicles. The municipality also wants to raise awareness among truck drivers of the freight traffic issue and of the freight corridor as a response to the problem.

Objective: Reduce freight traffic, congestion and pollution in the city centre.

Results: The route has been defined and corresponding road signs have been purchased. The installation of the signs started in May 2010. By 15 December, 2010, signs and devices had been installed at 43 critical points along the corridor. Next, the city will develop a GPS navigation system to mark routes and guide freight traffic according to truck drivers' needs. This GPS system will be distributed to logistics firms and truck drivers together with general information about the new traffic corridor.
Results expected:

- A decrease in the volume of and time spent in traffic jams caused by traffic from the harbour; and
- A decrease in air pollution during peak freight traffic hours.

4.3 Environmentally friendly vehicles

Access to low emission zone in cities is now often restricted by city regulations to clean, silent and fully loaded vehicles. These regulations respond to the higher demand of the public opinion concerning health issues and to European standards for urban air quality (Dablanc, L., 2008). The requirements are based on the environmental impacts. In Paris, since 2007 only electric, gas, EURO V commercial vehicles are allowed to access the city in the afternoon. In Lyon, electric vehicles are exempted from weight and time limitations for delivery in the city. In other cities, only electric vehicles can deliver in the city centre after around 10 am in pedestrian zones.

Eight examples are presented below.

4.3.1 PETITE REINE: final delivery by electric cycle project (Paris, France)

Start date: 2003
Category: organizational, technical, infrastructural – urban planning, supply chain management
Stakeholders: La petite Reine company, the City of Paris and ADEME (French Agency of Environment Management).

Description: This concept is based on the use of new vehicles for the last mile delivery services.

Objective: the experiment aimed at replacing diesel vehicles by electric tricycles for final deliveries in Paris. (B. Salzenstein, City of Paris, TURBLOG_WW)

- Main approach by electric shuttle from outside hub to transit facility inside Paris
- 600 sq.metre transit facility located in underground parking lot.
- Final delivery by 30 electric tricyles (1,400 litres Capacity load: 180 kg, Speed: 20 km/h, Length: 2.50m).

Picture 8: Tricycle Third generation. (SUGAR)

Results: 700 000 deliveries in 2005 and a reduction of 660 000 km diesel vehicle mileage. A good perception by the retailers (SUGAR). Assessments are on-going.

4.3.2 CHRONOPOST: Express freight clean delivery project (Paris, France)

Category: organizational, technical, infrastructural – urban planning, supply chain management
Stakeholders: City of Paris and Chronopost

Description: The Chronopost company in France is a major transporter (250,000 parcels deliveries/day, 230 countries covered) (B. Salzenstein, City of Paris, TURBLOG_WW). The solution includes an underground urban logistics area at Place de la Concorde that handles the distribution of parcels to the 7th and 8th arrondissements of the capital using clean vehicles.

- In 1999 Chronopost International designs its electric trolley, Chrono Trolley and introduce it in a few cities in France and abroad
- In 2006, a small vehicle Chrono Van is introduced
- In 2010, four new electric vans have been added to the fleet

Objective: the experiment aimed replacing diesel vehicles by cleaner solutions for final deliveries in Paris.

Picture 9: Chronopost vehicle in Paris. (TURBLOG_WW)

Results: Between 2006 and 2008.

- Reduction of 61546 km
- Reduction of 54 % greenhouse gases (2/3 thanks to electric vehicles)

- Reduction of 55t of CO_2
- A 20% productivity gain

4.3.3 MONOPRIX supermarket clean delivery project (Paris, France)

Category: organizational, technical, infrastructural – urban planning, supply chain management
Stakeholders: the city of Paris, Monoprix and private carriers

Description: Monoprix is a chain of supermarkets with sixty stores located in Paris. These stores receive non food products and non alcoholic beverages by rail. A twenty wagon train arrives in Paris Bercy station (in the eastern part of Paris) every evening. Pallets are then transferred to CNG operated trucks which deliver the stores early in the morning. (Dablanc, 2009)

Objective (B. Salzenstein. City of Paris, TURBLOG_WW)**:** delivering 1000 daily tons while reducing total mileage and environmental impact.

- Main approach by rail link (30 km) from outside warehouse to transit facility inside Paris
- Emphasis on visual and environmental (noise) integration of Paris transit facility
- Final delivery to 60 outlets by 35 gas lorries.

Picture 10: CNG lorries for the distribution of goods – MONOPRIX supermarket (B. Salzenstein).

Results:

- Reduction of CO_2 emissions
- Increase of transportation costs

210,000 pallets per year are distributed this way, with a yearly saving of 10,000 diesel trucks, 280 tonnes of CO_2 and 19 tonnes of NO_x. The City of Paris has invested €11 millions in the project. The Monoprix rail project is technically satisfactory but its operation is quite expensive, with an additional cost of 25% compared to the former all road solution. (Dablanc, 2009)

4.3.4 Cargohopper (Utrecht, the Netherlands)

Category: organizational, technical, infrastructural – urban planning, supply chain management
Stakeholders: the city of Utrecht, carriers and retailers

Description: Cargohopper is a vehicle that is able to tow 3 metric tons in a linear line by means of a 48 Volt 28 hp electric engine. Its max speed is 20 kilometers an hour but that is more than enough as it is only driving in the inner city of Utrecht and does not make more mileage than 60 kilometers max daily. The three trailers are steered on both axles which gives it a great manoeuvrability. Cargohopper is designed for the delivery of packages (not for pallets) and is able to do the work of 5 to 8 regular (European sized) vans. The

boxes are preloaded outside the city in the Cargohoppers Distribution Centre and towed to the boarder of the inner city by means of a regular truck. There we have a transshipment point where the boxes are put on the Cargohopper and rolled into the pedestrian zone. Once empty, it collects dry carton, paper and empty packaging from shops for recycling so it never runs empty.

Objective: the experiment aimed replacing diesel vehicles by electric vehicles for final deliveries.

Picture 11: Cargohopper in the city of Utrecht.

Cargohopper has zero emission and is allowed in the inner city at any time and any place. It is also quite narrow: only 1.25 metres wide.

Results: Cargohopper removes up to 100.000 Van kilometers from the inner city streets and saves approx. 30 tons of CO_2 on an annual basis.

4.3.5 New distribution truck (Lyon, France)

Project: FIDEUS (2005-2008)
Category: organizational, technical, infrastructural – urban planning, supply chain management
Stakeholders: the city of Lyon and carriers
IT support: FIDEUS telematics platform, driver assistance system

Description: The EU FIDEUS project has supported the development of a complete distribution truck – a Renault Midlum – equipped with several new features. The vehicle underwent final trials in Barcelona and Lyon, with a particular focus on night deliveries. Receiving an alert from the FIDEUS telematics platform when entering a low emission zone (LEZ), the driver activates a driver assistance system to operate the truck in the low noise mode. The truck was to be tested by real customers in Lyon and Barcelona (DHL and Condis food).

Objective: the experiment aimed replacing diesel vehicles by cleaner vehicles for final deliveries.

FIDEUS has developed three different demonstrators, a microcarrier for the pedestrianised area of the city of Hannover, a 3.5-tonne light-duty truck developed by Centro Richerce Fiat/IVECO and a 12-tonne Renault Midlum truck with a 190-hp engine, developed by Volvo 3P. (Renault trucks)
Features were developed for FIDEUS in three main areas – *Driver environment & transport efficiency, Environmental protection, driver environment and Security*.

- A sub-project was entitled Electronic parking brake (EPB) – a safety function for distribution truck drivers.

- Other features include a reversing camera with a warning, as well as various working and riding lights for working in darkness, including a movable information display for warning other traffic during loading operations – all for the purpose of reducing the driver's workload. (Renault trucks)

Picture 12: The FIDEUS vehicles tested in Hanover, Lyon and Barcelona. (FIDEUS)

Results:
The results are considered as positive and encouraging. In Hanover, there was a reduction of effective delivery time even though the micro carrier spent more time in the pedestrian zone than a normal van. On the whole, the operation was reported as efficient with a high quality with a different logistics set up.
The new vehicle technology of Low Noise Mode (LNM Barcelona) and Low Emission Modes (LEM Lyon) reduces truck noise and emissions significantly. (FIDEUS final report, 2008)
Compared to Hannover, the Lyon tests show lower impacts of second lane parking on overall traffic. The use of the vehicle shows a very good emission reduction record in Lyon. The activation of the Low Emission Mode, that limits vehicle speed and acceleration, led to a net reduction of 5.9 litres/100km in average during the test days. Eco-driving behavior had clearly positive impacts on emissions and noise.
The noise record of Lyon showed a clear reduction compared to other trucks. The records of unloading operations show a clear improvement by using low noise equipment compared to other standard equipment.

4.3.6 Environmental-friendly Light Commercial Vehicles (Parma, Italia)

Project: ECOLOGISTICS (since 2008)
Category: organizational, technical, infrastructural – urban planning, supply chain management
Stakeholders: Municipality of Parma, INFOMOBILITY, Environment ministry, Emilia-Romagna Region and CAL Centro Agro Alimentare e Logistica Consortile di Parma

Description: The CAL freight transport infrastructure represents an urban transit point (Urban Distribution Centre - UDC) where the flow of goods arrive from different places so they can be loaded on environmental-friendly light commercial vehicles (LCVs) to fill them completely and this way optimize the route of every

single vehicle. The methane and electric vehicles travel at full capacity to reduce the useless traffic and environmental impact. (C-LIEGE)
For the activation of the Ecocity service 6 JOLLY CH4 CNG Power supply vehicles (GWV 3500 Kg) were purchased. All the vehicles are Euro 4 emission type with methane plant "BRC Gas Equipment" FASTNESS MPI injection sequential-phased. This facility is in compliance with European Regulation NR 110. Three of the six vehicles adopt the THERMO KING fridge configuration with constant cooling that keep the temperature on 12°C and lifting platform(normal lifts) with remote control and commands on the platform. The other three vehicles are characterized by an installation made up of vans with aluminium panels and lifting platform (normal lifts) with remote control and commands on the platform. A data transmission platform has been developed at CAL to optimise the logistics management. It is possible to share and transfer data and information in real time between all the people involved in the deliveries. The platform supervises every transaction and the whole course of the cargos, the handling of the orders, the journey plans and all the other services. (C-LIEGE)

Objectives:

- to rationalize goods distribution process in Parma, starting with the historical centre, allowing reduction of air pollution as well as traffic congestion (C-LIEGE)
- to reduce air pollution

Results: The methane average consumption resulted to be about 1000kg every month, the correspondent with diesel oil have been 840 liters. Ecocity vans travel always full and deliver more shops than an individual carrier. The proportion between an Ecocity van and single carrier is 1 to 8.
Every low emission vehicle of Ecocity with methane engine spends averagely 40 hours/month in the Limited traffic Zones and at the same time travels 195km/month. The achieved results are: - 6492 Heavy Vehicles, - 88.704 km travelled by Light vehicles, - 17.530 km travelled by Heavy Vehicles, - 300 kg of CO, - 216 kg of NOx, - 37 t of CO_2, -13 kg of PM10, - 11 kg of PM2.5, - 38 kg of VOC.

4.3.7 Freight transhipment (Bath, UK)

Project: CIVITAS RENAISSANCE (2008-2012)
Category: organizational, technical, infrastructural – urban planning, supply chain management
Stakeholders: The city of Bath, Bristol City Council and carriers

Description: To reduce their environmental impact the city will transfer goods to more environmentally friendly vehicles. Bath is developing a facility close to the main road network, where goods can be transferred to a smaller, electric vehicle and then brought into the city centre. Goods for the participating retailers are being delivered to a warehouse on the edge of the city. These goods are then transferred and dispatched at pre-arranged time slots using the electric delivery vehicle.
A comprehensive survey of retailers in central Bath was carried out to establish a baseline position for deliveries to the area and to ascertain the expected demand for a freight consolidation operation.
A joint exercise with Bristol City Council to procure a contractor to operate the freight consolidation centre was successfully completed and the one year demonstration project for urban freight consolidation in Bath commenced on 4th January 2011. There are currently five businesses with eight stores that have signed up to the scheme.

Picture 13: Electric vehicle delivering goods in the city centre of Bath, UK.

Results expected:

- 30 retailers signing on as participants in the scheme;
- A reduction in the number of delivery vehicle movements to the participating retailers by 70%;
- A reduction in average NO_2 concentrations from 53.3ug/m3 in 2003/4 to 47.03ug/m3 by 2011/12.

The evaluation team will need to conduct quantitative analysis and evaluation with expert informants to determine the extent to which the measure has been a significant factor.

4.3.8 Goods delivery by Cargo Tram (Amsterdam, The Netherlands)

Project: Goods delivery by Cargo Tram in Amsterdam. (2007-2009)
Category: organizational, technical, infrastructural – urban planning, supply chain management
Stakeholders: CityCargo, the city of Amsterdam and carriers

Several examples of freight trams: (T. Zunder, NewRail)

- Cargo-tram supplies Volkswagen in Dresden with parts of automobile production.
- Cargo Tram in Zurich: Waste collection.
- City-Cargo in Amsterdam.

Description: From 7-31 March 2007, CityCargo Amsterdam held a pilot project using two cargo trams to distribute goods in the city centre of Amsterdam. The pilot project wanted to demonstrate that the use of trams to deliver goods in the inner city is viable. (ELTIS)

Objective: reducing the number of trucks in the inner city. According to their initial feasibility study, up to half the lorry movements in the city could be replaced by trams thus cutting pollution by 20%.

Picture 14: City Cargo in Amsterdam. (T. Zunder, NewRail)

CityCargo operated two cargo trams for a testing phase on the existing tram network between 7 March and 3 April 2007. The trams run along a specially selected route through the city between 7am and 11pm. Two transfer points were located on the route where the goods were unloaded onto small electrically powered

vehicles which enabled the delivery of the goods to their final delivery address. For the first two weeks the trams travelled empty, to assess the traffic situation along the route. Passenger tram schedules were not affected by the cargo trams because the cargo trams did not use passenger stops.
During the second phase the trams transported actual goods. Since the pilot was successful, CityCargo Amsterdam was allowed to use the Amsterdam tram network to transport goods with a 10 years concession from the Municipality. (ELTIS)

Results: CityCargo estimated around 50 cargo trams and around 400 Ecars to be operated in 2008 in order to supply shops, supermarkets and the catering industry in the centre of Amsterdam. The system was also presented as very cost efficient: 1 cargo tram can transport the same amount of goods as 4 (7.5 ton) trucks.
The estimation of impacts on health and the environment reported a reduction of up to 16% in PM, CO_2 and Nox as well as more efficient loading and less noise pollution in the city because noisy trucks will be replaced by quieter trams.
Amsterdam's cargo tram initiative went bankrupt in 2009 as the city refused to contribute to the extra tracks needed. (ELTIS)

4.4 Intelligent traffic management

The current traffic management systems are not able to identify, track and trace freight vehicles arriving in the cities. A number of research projects addressed this issue (e.g. SMARTFREIGHT) and highlight the importance of interfaces between traffic management systems and freight distribution management systems for city access restrictions and freight route guidance.
Automatic Number Plate Recognition is a control system used to recognize the HGVs entering urban areas. An example is given below.

4.4.1 Demand management for goods vehicles (Bath, UK)

Project: CIVITAS RENAISSANCE (2008-2012)
Category: organizational, technical, infrastructural – urban planning, supply chain management
Stakeholders: TM center, the city of Bath and carriers

Method: A variable message sign will be installed at the junction, which will be triggered by high vehicles, giving the message that there is a weight restriction ahead. Automatic Number Plate Recognition (ANPR) cameras covering both directions will be installed to the east of this junction, triggered by vehicle detection loops. When HGVs that are not making deliveries to the area affected by the weight restriction are identified, details will be obtained from the DVLA and a letter sent to the operator informing them of the weight limit and asking for details of their journey. The information collected will allow the Council to identify vehicles that persistently breach the weight restriction. Where this is the case, further action will be considered. The demonstration is being set up on the A4, Upper Bristol Road in Bath at the junction with Windsor Bridge Road. The section of the A4 east of this junction is subject to a Traffic Regulation Order weight limit of 7.5 tons.

Objective: The measure is designed to make Heavy Goods Vehicle (HGV) operators aware of weight restrictions in the historic city centre of Bath and that the A4 route, which runs through this area, should not be used by heavy vehicles.

Results expected:

- Reduce the number of HGVs using the A4 east west route in Bath;
- Contribute to reducing the average NO_2 concentrations.

5 Delivery spaces

The lack of delivery spaces in dense urban zones and the growth of freight vehicles led the cities to find other available solutions: sharing of curbside parking spaces with private cars, underground parking places, and dedicated areas for vans and trucks where the deliveries are completed by cleaner vehicles. Other solutions aim at delivering the packages in special boxes where consignees can find them. These solutions solve the problem of undelivered packages when customers are not at their home or office.

5.1 Delivery times

Delivery time windows and booking of loading spaces are solutions to reduce the number of freight vehicles in cities. The various cities reviewed suggest slightly different peak times of day for deliveries and collections of retailers; however the consensus is that the morning (from 6:00am to 12:00am) is the busiest period (Browne, M., 2010). The deliveries are made on weekdays (Monday to Friday).
The city authorities have to adapt their access regulations on delivery time windows to make distribution plans efficient and profitable in dense urban areas. Surveys amongst suppliers and retailers determine when deliveries are done, weekdays, in the night or early hours, and when the stores are opened or closed.

Three examples of regulations concerning loading and unloading time windows are presented below.

5.1.1 Broadening of loading and unloading times (Amsterdam, The Netherlands)

Category: organizational – urban planning, supply chain management
Stakeholders: the municipality of Amsterdam, residents, carriers, shippers and entrepreneurs.

Description: Several districts have set time windows for loading and unloading in order to reduce noise, odors, and unsafe situations, and to avoid congestion and to optimize parking spaces. Loading and unloading are permitted during certain periods of the day on one or more parking spaces. At congestion areas, one or more delivery bays are usually available. Outside these times, parking spaces are for cars.
At certain locations, delivery times for loading and unloading at night are not permitted. It is permitted within the boundaries of sound legislation: between 19.00 - 23.00 pm: up to 65 dB (A) and between 23.00 - 07.00 pm: up to 60 dB (A). In the city of Amsterdam, delivery is available in pedestrian areas between 7.00 and 11.00am.
For best results, the regulations on delivery times are strictly enforced (with fines) and it is not allowed to park in the streets for loading and unloading. The vehicles must park close to the facade to avoid hindering trams and pedestrians.

Objective: The figure below illustrates the new delivery plan for carriers:

- To reduce the number of trip km per vehicle in order to promote the consolidation of goods among neighbour cities.
- To create flexible time windows by introducing one hour more in order to reduce kilometers per vehicle and freight traffic. With wider delivery times, the carriers will enable to supply more stores per trip, to plan better delivery routes resulting in fewer vans and lorries in the city.

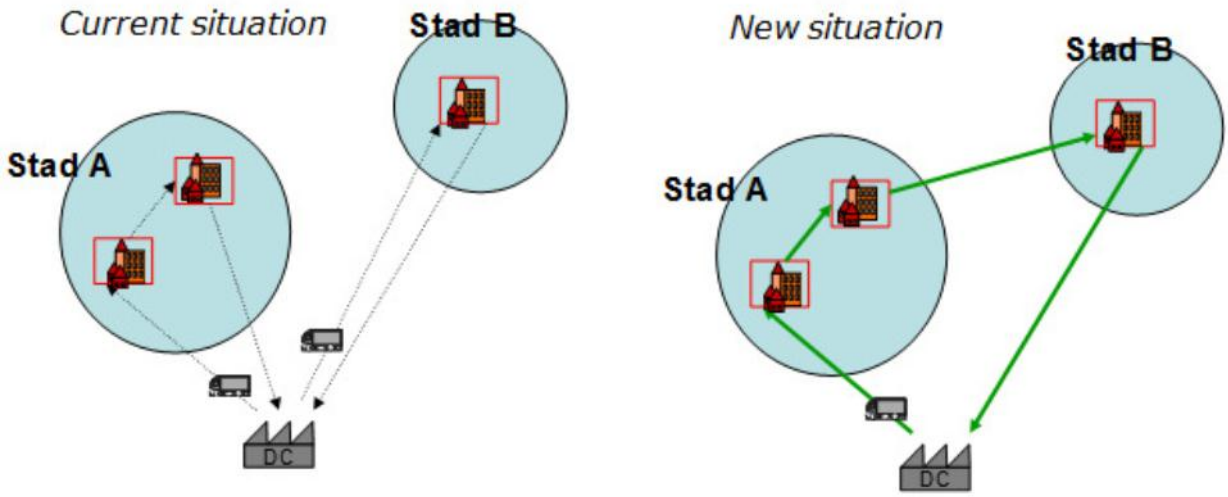

Figure 3: Broadening of loading and unloading times in the city of Amsterdam. (C-LIEGE)

Results:

- Expected effect of measures (Erik Regterschot, 2011)
- Reduction of kilometers
  - Time windows: -4% kilometers of freight transport
  - Consolidation of goods: -5% kilometers of freight transport
- Reduction of NO-concentrations
  - Time windows: -0,1 µg/m3
  - Consolidation of goods: -0,2 µg/m3
  - LEZ's: -0,6 µg/m3
  - Electric freight transport: -0,3 µg/m3

5.1.2 Night and off-hours deliveries (Ile de France)

Category: organizational, technical, infrastructural – urban planning, supply chain management, access restrictions
Stakeholders: the city of Paris, carriers' and shippers' associations

Descrition: To deliver every day more than 700 000 establishments and around 11 millions of people, 1 million of deliveries and removals are done in Ile de France (Devin, 2011). In June 2006, the city of Paris and the most important carriers' and shippers' associations signed an urban freight transport charter, in which they committed to certain points, which are favourable to the environment, working conditions and the productivity of urban delivery activities (Dablanc, 2009). Paris has banned trucks (over 29 m2) during day time and on-street delivery areas must be at least 10 meter long, to facilitate trucks' manoeuvres and the handling of goods. A transport department's guideline imposes a minimum of one delivery bay every 100 meters in the city streets. Some bus lanes are shared with delivery vehicles. In Paris since 2007, deliveries in the afternoon are only allowed by commercial vehicles that are electric, gas or that follow Euro norms (Euro III now, Euro IV on 1 January 2009 and Euro V on 1 January 2010) (Dablanc, 2009).

Objective:
The objective of night deliveries is providing better conditions for delivery of goods, avoiding morning congestion.

Results:

The implementation of night/off-hour delivery has several key benefits reported in the C-LIEGE project:

- Reduces delays for the logistic service providers and increase efficiency
- Reduces emissions and energy consumption (less congestion during night time, direct access to the shops)
- Enhances road safety
- Optimizes the use of public space (time and space sharing)
- Use of quiet freight vehicles and silent loading/unloading material (PIEK standard)

The PIEK-standard has been adopted in several countries like the UK, France, Germany and Belgium. All these projects use the TNO report and the certificates granted by the national parties as the harmonized standard.

Picture 15: Silent truck for night deliveries, 2008. (Goevaers, 2010)

Some disadvantages are advanced by transporters as the necessary staff during night deliveries, quiet vehicles, silent loading materials, security, etc. Also residents are against night deliveries because of noise nuisance. Some weaknesses are reported in the C-LIEGE project:

- Higher cost for quiet vehicles and silent loading material
- Higher personal costs for receiving deliveries during night hours
- Small businesses cannot afford it
- Need for local legislation for night and off-hour deliveries and night work time
- Complaints of residents nearby the shops

5.1.3 Night deliveries (Barcelona, Spain)

Project: CIVITAS MIRACLES (2002-2006)
Category: organizational, technical, infrastructural – urban planning, supply chain management, access restrictions
Stakeholders: the Barcelona Municipality Road and Traffic Department SVP, and Mercadona, a chain of supermarkets, and member of AECOC, Spanish suppliers and retailers association.

Description: In Spain, all the cities have a provision of load zones and restricted access to zones depending on vehicle weight, normally banning trucks over 3.5 t from city centres. There are also strict regulations such as city truck routes. Truck parking is normally limited to a maximum of 30 minutes and only as long as the load/unload operations are being carried out. The freight vehicles are sometimes allowed to use parking places and can be exempted to pay the parking meters. Load zones are always at fixed schedules (usually 7:00-11:00 and 15:00-17:00). In the night, they are allowed to park everywhere and this scheme can be an option for transporters who want to avoid collaborative networks (Muñuzuri, 2011).

Method:
In 2003 the Barcelona Municipality, within the MIRACLES-CIVITAS project, realised trials to demonstrate unloading at night using an especially-adapted lorry. Surveys identified that the main freight operators were interested in realising deliveries outside the regulated hours of 08.00 – 20.00. Within this context, a pilot experience has been realised on the street frontage of a supermarket located in the central area of Barcelona, between 10.00 and 12.00pm. To minimise the main negative effect, noise, the lorry was equipped with a carpeted floor, the lifting system worked with a low-noise pneumatic technology and the carriers to transport goods had low-noise rubber wheels. (ELTIS Case studies)

Objective:
The objective of night deliveries is providing better conditions for delivery of goods and a reduction of city pollution level, avoiding morning congestion and the blocking of narrow streets.

Benefits: As for the Ile de France, the benefits and disadvantages are quiet similar.
The journey times and energy consumption are reduced and heavy vehicles can access the city center during the night. Night time driving takes only 1/3 of the time necessary during day Time. A part of the night deliveries is done with PIEK material and trucks. Success strongly depends on the willingness of transporters in adopting new quieter vehicles. (C-LIEGE)

Picture 16: Night deliveries in Barcelona (NICHES)

Results: (from C-LIEGE Workshop)

- Reduce journey times: 50%
- Reduce fuel consumption: 32%-57%
- Reduce emissions: 30%-53%
- More loading capacity
- Not possible for small business (Staff during night hours)
- Large investments for quiet vehicles and silent loading equipments
- Negligible increase of noise level: +0.3dB(A)
- Higher personal cost: +25%

The result was quantified in terms of noise measures compared to ambient noise levels on nights when the delivery was not being made; the average of the minimum values recorded during unloading inside buildings (23.5 dB(A)) was 0.3 dB(A) greater than those recorded before loading started; for maximum values no difference was recorded for measurements inside buildings (33.4 dB(A)), and the maximum values recorded in the street varied by only 0.1 dB(A) average with unloading of 52.2 dB(A) (Mercadona supermarket, Niches report).Unloading with negligible increase in noise levels, 0.3 dB(A). No resident complaint was registered in Barcelona at the test site in 2003. Initial results are that noise levels differ very little from

ambient conditions (increase of 0,3 dBA). Up to seven (peak-hour) deliveries are substituted by two night-time deliveries using the quiet larger vehicle.

5.2 Delivery space booking

Booking of delivery spaces requires staff and infrastructure as well as strict procedures and strong management systems.

Two city initiatives are presented below.

5.2.1 Local delivery spaces (Bordeaux, France)

Category: organizational, technical, infrastructural – urban planning, supply chain management
Stakeholders: The chamber of Commerce, the Municipality of Bordeaux and about 15 transport operators.

Description: Several cities in France (Rouen, Bordeaux, La Rochelle, Monaco) have developed a new strategy of urban distribution platform to promote urban logistics spaces for delivering small packages. Dedicated staff at the urban transshipment platform provides assistance for the dispatching of consignments for the last mile (from 500m to 1km inner Rouen). From incoming trucks, goods are unloaded onto carts, bicycles, and boxes for the final distribution leg. Moreover, the approach foresees to provide additional services (home delivery, short time storage, pick up of consignments etc.). (ELTIS)

Objective: Create an urban transshipment platform aiming at

- facilitating the delivery of small packages inner city
- decreasing the number of trucks inner city centre
- decreasing environmental impacts caused by freight transport
- decreasing noise levels by using low noise loading/unloading systems

Picture 17: Local delivery spaces (ELP) in Rouen. (CCI Rouen, ELTIS)

An employee provides support at the site, facilitates the maneuvering of the trucks and access to a parking space (around 75 m2 for 3 to 5 vehicles). The incoming consignments will be regrouped and put on vehicles for the final distribution leg. A storage area is linked to the transshipment point for short term storage.

Results
The evaluation was done by an independent consultant for the city of Bordeaux (Gerardin, 2004). The impacts on traffic congestion were not part of the evaluation.
Method:

- Surveys of satisfaction amongst carriers, truck drivers, shop owners, retailers, delivery men.

- Quantitative analysis of the use of the delivery spaces (number of users, days of use, number of stops per user and per day, type of goods being transported, etc)
- Estimations of environmental impacts

The approach received positive feedback from the transport operators as well as from retailers and shop owners (ELTIS). The mail and freight express companies are the users who showed a great interest of using these delivery spaces, especially public services. There was a high demand for delivering between 10:30 and 12 o'clock. The site was moved due to the construction of tracks for the tramway, which made changes between the users.
Estimations: dispersion of observed results, gains by tour ranging from 0 to 5.3 km, number of shipments from the delivery space ranging from 1 to 6, reduction of energy consumption, average reduction in emissions of CO_2 by stop: 845 g, about 40 kg per day.

5.2.2 Delivery space booking (Bilbao, Spain)

Project: FREILOT (2009-2012)
Category: organizational, technical, infrastructural – urban planning, supply chain management
Stakeholders: transporters, drivers, the city of Bilbao and manufacturers
IT support: electronic booking system

Description: When no delivery space is available, the drivers use double parking inner city. Unfortunately such stops have negative impacts on traffic flow, environment (by increasing CO_2 emissions) and on safety. (FREILOT)

Objective:
One of the four measures in the FREILOT project is to give the driver the ability of booking a delivery space before he arrives at his delivery point.

Figure 4: Joint measures (FREILOT).

The objectives of the Bilbao pilot study were:

- to increase the number of stops on delivery areas and to optimise delivery times
- to improve traffic flow and reduce congestion
- to avoid double parking and to avoid searching for delivery space
- to reduce driver stress and improve driver work conditions.

If the vehicle is out of schedule the operator could reassign a new delivery space according to the new time schedule in order to keep the delivery area available for the other users. This measure will optimize the routes for each truck; reduce the kilometers and number of stops.

Picture 18: Delivery space vehicle/driver identification unit (FREILOT).

Results:

- Data collected with dataloggers installed in the trucks, intersections and delivery stops.
  - Vehicle data registered using a GPS device
  - Data stored in the booking system
  - Observation method for infraction at delivery spaces
  - Sensors for traffic data collection
- Data from questionnaires presented to the fleet operators and truck drivers.
- Data from traffic simulations.

Indicators for delivery space booking: Consumption per km, CO_2 and NOx emissions, average travel time, number of stops, number of double parking, etc
Final results are not yet available.

5.3 Alternative delivery systems

To reduce congestion in urban areas, alternative delivery systems are developed to find other ways to make environmental friendly the last mile of the deliveries inside cities.

Five new delivery systems are presented below.

5.3.1 Freight bus and delivery van (Lyon, France)

Project: CityLog (2010-2012) (18 partners from 8 European countries)
Category: organizational, technical, infrastructural – urban planning, supply chain management
Stakeholders: Public authorities and SMEs

Objective: To contribute to the improvement of the overall city logistics efficiency through a combination of several measures.

Description:
Technology

- New vehicle solutions
- Info-telematics support functionalities
  - Optimized trip planner
  - Ad hoc map attributes
  - Dynamic navigation services
  - Last mile parcel tracking

Process review

- Vehicle-to-vehicle transshipment
- Innovative and interoperable load units

3 containers on a truck, a freight bus from the depot to the transhipment areas. Each container is loaded on a delivery van for last mile delivery downtown.

Figure 5: City Log concept. Transhipment.

Freight bus**:** EURO5 Renault Trucks Midlum, 16t (Augros, 2012)

- Air suspensions (rear & front) to raise the Load Unit
- Vulnerable Road User detection system on the cab
- Camera system for manoeuvring assistance

Delivery Van: IVECO ECO Daily 35S (Augros, 2012)

- Actuators to lift the Load Unit from chassis
- Tailboard and step for cargo access
- Camera and back sensors in rear bumper
- Pedestrian detection system

Picture 19: Delivery van - Prototype

Load unit: 3 prototypes (Augros, 2012)

- Box on foldable legs
- Dimensions: 2.2m x 2.2m x 2.2m (~10 m3 interior)
- Doors: Double rear door and Lateral sliding door
- Payload: 800kg

Results: achieved

- User needs collection, stakeholders' consultation and use case definition,
- Implementation and integration of telematics solutions (pre-trip planner, dynamic navigation service, ad hoc map attributes and last mile parcel tracking),
- Transshipment modeling for Freight Bus and Distribution Van,
- BentoBox concept development and prototyping.

The Freight bus will be tested from March 2012 to June 2012 in Lyon and Turin.

5.3.2 BentoBox (Lyon, France)

Project: CityLog, 2010-2012 (18 partners from 8 European countries)
Category: organizational, technical, infrastructural – urban planning, supply chain management
Partners: Public authorities and SMEs
IT support: Mobile communication system

Objective: (Augros, 2012)

- Reduce unsuccessful deliveries (and driven km) when customer is not at home

Method: (Augros, 2012)

- Decouple parcel delivery by carrier and customer picking up goods
- Mobile trolleys with parcels plugged in a docking station

Prototype: (Augros, 2012)

- Docking station with touchscreen HMI
- GPRS connection to back office
- 6 trolleys, 4 types of various drawers organisations

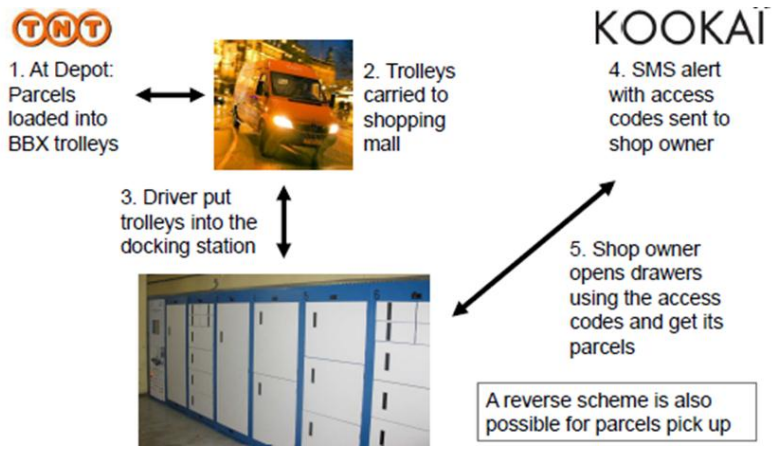

Figure 6: BentoBox, CityLog project (Augros, 2012)

Results: Tests from November 2011 to June 2012 in Berlin, Lyon and Turin for delivering goods to shops in shopping centres.

5.3.3 Mobile depot and tricycles (Brussels, Belgium)

Project: STRAIGHTSOL (2011-2014) (16 partners)
Category: organizational, technical, infrastructural – urban planning, supply chain management
Stakeholders: TNT Express, Dutch Technical University Delft, Ecopostale
IT support: logistics software

Description: The TNT Express demonstration aims to increase efficiency of operations for TNT's central Brussels parcel deliveries. In the baseline situation several vans drive from the TNT depot (located outside the city centre) to the city centre to deliver parcels. As in most large European cities, deliveries in Brussels are hampered by congestion which makes them both slow and environmentally unfriendly. To increase efficiency of operations, TNT plans to start using a mobile depot which is a trailer/truck fitted with all depot

facilities (i.e. loading docks, labelling, data entry). In the morning, this trailer/truck is loaded at the TNT depot with all deliveries for that day and carries them to a central location in the inner-city. Afterwards, a set of electrically supported tricycles carries out the last mile delivery operations. (STRAIGHTSOL)

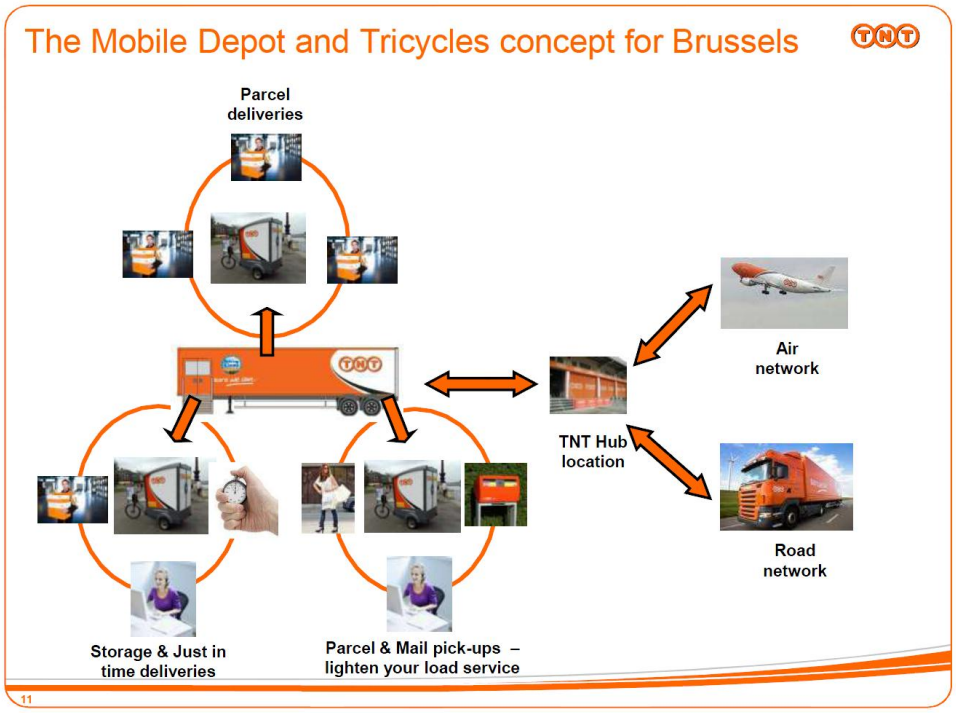

Figure 7: The mobile depot and tricycles concept for Brussels. (Hejine, P., 2010)

TNT already introduced an intermediate solution: one of their trucks takes all parcels destined for the city centre from the TNT depot to the depot of a tricycle logistics company Ecopostale. These parcels are sorted twice before leaving for their final Brussels destination: a first at the TNT depot and a second time at the Ecopostale depot. (STRAIGHTSOL)
The aim is to avoid this additional handling (cost) by introducing the mobile depot solution.

Results: Together with the Dutch Technical University Delft, TNT designed a mobile depot which will be built in the near future. Once it is ready, for a period of 9 months, all TNT parcels destined for the inner ring area will be delivered through this depot. (STRAIGHTSOL)
A long testing period which should enable TNT to decide whether the mobile depot solution can live up to these expectations:

- Decreased truck-kilometres
- Reduced costs per stop
- Delivery times and punctuality for inner-city operations are at least maintained
- Reduced CO_2 emissions
- Employee satisfaction and noise level are at least maintained
- Information flows are at least maintained

5.3.4 Packstations (Germany)

Category: organizational, technical, infrastructural – supply chain management
Stakeholders: Deutsche Post-DHL and consignees

IT support: logistics software

Several post and parcel operators are developing on-street package collection and delivery stations:

- Packstations by Deutsche Post-DHL
- Bpack 24/7 by the Belgian Bpost
- SMARTpost by the Estonian company CLEVERON
- Post 24 by the Austrian Post in Vienna
- Mana Pasta Stacija by PostService in Latvia
- Easypack in several cities in Spain
- Packstations by InPost in Poland

Description: The customers can register themselves on the website to use the service. When a package is delivered at the nearest packstation, they receive a personal code by SMS or email with the correct locker of the station. Customers can pick up, frank and send parcels 24 hours a day.
The packstations service from Deutsche Post-DHL has reached more than two million customers (status 2011). Customers are often not at home during daytime and cannot deliver their packages at the post office during opening hours. Success is also related to the rise of e-commerce purchases. Older machines are replaced by modular systems and new software is planned for 2012

Objective: To eliminate the need for end-of-chain delivery by motor vehicle.

Picture 20: DHL packstations in Germany (Post & Parcel)

Results:

- Around 2500 machines with more than 200, 000 employees in 1,600 cities in Germany.
- A growing number of customers
- 70 % of packages are being picked up within 24 hours

A threat reported from the C-LIEGE state of the art report: e-commerce is expected to grow further and this could cause more freight mileage due to the high number of packstations.

5.3.5 SLUS unmanned warehouse (Norway)

Category: organizational, technical – supply chain management
Stakeholders: carriers and SLUS company

Description: SLUS is an unmanned warehouse with a gate access system, using mobile and computer technology.

- A transporter - SLUS Transport. Authorize staff and send access messages.
- An unmanned warehouse - SLUS Warehouse. Authorize transport companies.

- A driver who identify himself with Pin code from access messages
- A SLUS system. Operated by SLUS to administrate, control and handle documents

The gate control is mounted on the gates. The system requires the use of electric locks and gate controls. The system turns off the alarm, turns on the lights, starts the surveillance cameras and allows the driver to pick up or deliver goods.
When the goods are in place, the driver presses the exit button on the control unit and locks in the goods. The SLUS system allows the driver to pick up and deliver goods when it suits the transporter or the customer.

Results: (SLUS)

- Reduction of shipping costs
- Reduction of waiting costs and time
- Faster distribution at night
- Reduction of transshipment costs
- Environmental improvements (delivery times in the evening or at night)

Conclusion

The conclusion of this report is based on the measures presented in the report as well as on scientific articles; this is due to the fact that it is difficult to make conclusions based on a restrictive number of city measures.

This report presents a large number of promising urban logistics measures or initiatives with focus on reducing pollution due to freight traffic to inner city centres. These solutions have as objectives to better use the road spaces and to organise efficient delivery times inside cities. Cities have started to develop and combine different kinds of measures aiming at reducing the number of delivery vehicles in urban zones.
Different levels of development between the cities make it quite difficult to quantify the benefits of the implementation of each measure. The measures have to be adapted and even modified to be used in different city configurations; coordinated goods distribution systems have also to be adjusted to local contexts and user requirements (Ljungberg, D., 2004).

Urban Logistics Plan
Public authorities pay more attention to freight transport in interurban and urban areas by taking into consideration the logistics operations in urban planning and development. However the conflicting needs of the different stakeholders and the lack of experts in city logistics measures working for urban authorities can in general constitute a real challenge for cities and local organisations (Muñuzuri J. et al., 2005). In France, it was proposed to create a region-wide authority looking at building permits for logistics developments in suburbs and at city levels, and new architectural solutions integrating logistic building within the urban core (Dablanc, L., 2008).
The two examples presented in this report show that it is useful for cities to develop a methodology to optimize the urban goods distribution by implementing a delivery plan with access restrictions. The results from Bologna in Italy and La Rochelle in France show a more efficient distribution of goods and a reduction in delivery vehicles. However it may be difficult for the city to require that the carriers share a van system and a booking-in-advance system of delivery slots. It seems preferable for cities to develop their expertise of the goods distribution inside urban zones and to enhance collaboration with all actors involved in the distribution business in order to plan together more efficient urban distribution plans.

Urban Consolidation Centre
The use of urban consolidation centres contributes to successful results in terms of energy efficiency for freight transport and reduction in congestion and gas emissions. These centres often require large public investments, use of public infrastructure and a strong commitment of private suppliers and retailers.
The six examples presented in this report show that the success of such measures depends mostly on the number of retailers participating to the consolidation scheme and the subsidies of the public sector. The level of satisfaction between the customers using the centre is often high and the results show a reduction in delivery vehicle movements and a reduction in exhaust gas emissions for these customers.
However some issues are cited, for example the city of Bremen in Germany met problems with the use of environmental-friendly vehicles; additional subsidies from the public sector were also necessary. In the city of La Rochelle in France, public investments were also indispensable to manage the operations and to finance the transport operator at the terminal.
The examples of Borlänge in Sweden and London Consolidation Construction Center in UK show that public and private partners developing a common delivery system for a certain type of goods (e.g. food, construction material) can achieve interesting environmental and economic benefits. These two examples are based on a measure concerning a limited number of partners and a type of goods delivered to a certain number of places; this can explain their successful results.

Freight quality partnership

Freight quality partnerships require strong cooperation between the freight transport operators through common platforms and/or working groups. A limited interest from operators in forming the group and low attendance at the meetings are the most commonly raised issues (Norwich, UK). These freight partnerships are essential for city authorities to plan new urban strategies including the freight transport (Urban Logistics Plan) (C-LIEGE). When a network is well established, the collaboration generally results in more sustainable and efficient freight operations (The Netherlands).

Low emission zones

The low emission zones require new environmentally friendly vehicles and better inner city logistics plans. The creation of these green zones enhances the use of cleaner vehicles and contributes to reduce pollution in dense urban zones (Aalborg in Denmark, London in UK and Utrecht in The Netherlands). Findings from European cities showed that targeted environmental regulations for freight transportation are among the most efficient ways to reduce emissions (Dablanc, L., 2008). Theses limited zones are however controversial solutions because of the additional costs met by private companies and the cost of enforcement of access restrictions to these zones is also rather high for public authorities (Utrecht, the Netherlands) (Campbell, J.F., 1994 and C-LIEGE, SUGAR).

Access restrictions

Access restrictions are already adopted measures in many cities. They are based on different regulations concerning the characteristics of the vehicles (Gothenburg in Sweden), the time windows (Ravenna in Italy), the loading factor (Riga in Latvia), the type of goods being transported, noise emission (e.g. use of electric vehicles, Bristol in UK), etc.

The cities are also looking for automatic control solutions for the enforcement of these access restriction policies (e.g. by plate number recognition, Ravenna in Italy or physical barriers, Ljubljana in Slovenia). The implementation of such ITS solutions requires high public investments and costs.

Incentives such as eco-driving training and priority lane for consolidation vehicles are also initiated combined with access restrictions and delivery time windows (Bristol in UK). In some cases, the incentives offered were found not efficient regarding increase in the loading rate of the participating partners (Gothenburg, Sweden).

Distribution plan

Distribution plans are strategic solutions aiming at better organizing freight distribution in inner urban areas (Sutton, UK). Tactical planning is particularly vital for intercity freight carriers that make intensive use of consolidation operations (Crainic, T.G., 2000). Delivery and servicing plans are promising solutions for partnerships to generate common goods collection and additional services (e.g. removal of waste and recycling packages).

Multiple use lane

The multiple use lane solutions for cleaner vehicles aim at optimizing the use of street areas (Barcelona, Spain and Norwich, UK). However the presence of too many delivery vehicles in public transportation lanes and lane width may create issues (Barcelona, Spain). A strict enforcement of these measures is found necessary in some cities (Barcelona, Spain) (Muñuzuri, 2011).

Optimization of routes

Another way to reduce travel times in cities is to optimize the routes of freight vehicles by defining routes and urban corridors to follow (Tallin, Estonia). This solution is partly based on a good information flow between city authorities and carriers. Technological solutions have to provide transport network information

and, traffic and travel time information through ITS applications (e.g. Variable message signs), navigation systems and open ICT services.

Environmentally friendly vehicles
The use of environmentally friendly vehicles combined with low emission zones and consolidation schemes are successful solutions to reduce the environmental impact. In some cities, these vehicles have access to urban areas and pedestrian zones with no access time restrictions (Paris, France). Incentives combined with financial support by public subsidies for the purchase of clean vehicles are of course success key factors (Parma, Italy).

Intelligent traffic management
ITS solutions (e.g. automatic plate number recognition and toll collection, Bath, UK) to enforce the access restriction regulations combined with eco-driving are found as expensive but efficient solutions (e.g. London). Advanced Traffic Management Systems can provide information on traffic conditions resulting in better route choice, fewer miles travelled, and reduced fuel consumption (Benjelloun, A., 2010). Advanced Fleet Management Systems can also contribute significantly to the efficiency of several city measures.

Delivery times
The delivery time windows and the booking of loading spaces are seen as good solutions to reduce the number of freight vehicles in cities (Amsterdam, The Netherlands). A night delivery system in Barcelona and in the Ile de France region shows that logistics operations can be conducted at night without creating a detrimental noise problem for the residents (Forkert and Eichhorn, 2008).

Delivery space booking
Loading space booking and control for urban freight requires financial support and strict procedures to manage loading space reservation (Bordeaux, France). Mc Leod et al., 2011 showed that different factors should be taken into account when evaluating a managed loading bay system, from the standpoints of the various actors involved, including the traffic authority, freight operators, drivers, retailers and other road users. The FREILOT Real-time loading/delivery space booking seems to be promising for increasing energy efficiency in freight transport and CO_2 emission reduction through the deployment of ITS services (Bilbao, Spain).

Alternative delivery systems
Last mile solutions with a combination of cleaner vehicles and common collect points are not yet evaluated except the success of DHL packstations in Germany. A survey among retailers in Rome showed that a large portion will not use a pick-up point unless the costs are covered by the carriers (Stathopoulos, A., 2012).

Most of these measures report positive results; however a thorough analysis and impact assessment methods are necessary to transfer logistics practices from one city to another (Macário, R. et al., 2008). The urban logistics practices identified in this report reveal also the importance of collaboration between all the stakeholders from conception phase to the implementation phase.

6 International Projects

The aim of this section is the clustering of relevant research projects. Some of these projects proposed several good practices for freight distribution relating to better use of road space and/or day time.

6.1 Project referenced in the report

6.1.1 BESTUFS I and II

BESTUFS: Best Urban Freight Solutions.
Project duration: 2000- 2003 and 2004-2008. Developed by public authorities and private partners.
Objective: The initiative aims to facilitating exchanges of experiences and knowledge with colleagues from other cities.
Results: A best practice handbook collected good practice examples from all over Europe.

6.1.2 CITYLOG

CITYLOG: Sustainability and efficiency of City logistics.
Project duration: 2010- 2013. CITYLOG is coordinated by FIAT Research Centre, it involves 18 partners in 6 different European countries, including industries, research institutes, associations and local authorities.
Objective: The CITYLOG European project is a focused research collaborative project. The objective is to increase the sustainability and the efficiency of urban delivery of goods through an adaptive and integrated mission management and innovative vehicle and transport solutions.
The logistic-oriented telematics services can be improved from three points of view

- Logistic-oriented telematics services
- Vehicle technologies
- Innovative load units

Planning of tests 2011-2012.

6.1.3 CIVITAS

CIVITAS: Cleaner and Better Transport in Cities
Project duration: Third phase, CIVITAS Plus (2008-2013)
Objective: The CIVITAS Initiative ("City-Vitality-Sustainability", or "Cleaner and Better Transport in Cities") was launched in 2002. Its aim is to support cities to introduce ambitious transport measures and policies towards sustainable urban mobility. The goal of CIVITAS is to achieve a significant shift in the modal split towards sustainable transport, an objective reached through encouraging both innovative technology and policy-based strategies. 25 cities are now working together on five collaborative projects in the third phase of the project. The so-called demonstration cities are part of the larger CIVITAS Forum network, which comprises almost 200 cities committed to implementing and integrating sustainable urban mobility measures.
CIVITAS ARCHIMEDES: Achieving Real Change with Innovative Transport measures demonstrating Energy savings
CIVITAS CARAVEL: Travelling towards a new mobility
CIVITAS CATALIST: Clean urban freight and passenger transport.
CIVITAS ELAN: Mobilising citizens for vital cities
CIVITAS SUCCESS: Smaller Urban Communities in CIVITAS for environmentally sustainable Solutions
CIVITAS MIRACLES: Multi initiative for Rationalised Accessibility and Clean Liveable Environments
CIVITAS MIMOSA: Making Innovation in Mobility and Sustainable Actions
CIVITAS MOBILIS: Mobility Initiatives for Local integration and sustainability
CIVITAS MODERN: Mobility, Development and Energy use Reduction

CIVITAS RENAISSANCE: Testing innovative Strategies for Clean Urban Transport for historic European cities
CIVITAS SMILE: Towards Sustainable Mobility for People in Urban Areas
CIVITAS TELLUS: Transport and Environment Alliance for Urban Sustainability
CIVITAS TRENDSETTER: Ameliorate urban air quality and reduce noise levels and congestion while supporting sustainable mobility and improving quality of life
CIVITAS VIVALDI: Visionary and Vibrant Actions through Local transport

6.1.4 C-LIEGE

C-LIEGE: Clean Last mile transport and logistics management.
Project duration: 2011-2013
Objective: C-LIEGE is the showcase for good practices for European cities in the aim for improving air quality, accessibility, road safety and economic vitality by reducing the number of inner city freight kilometres and by adopting "clean" vehicles. C-LIEGE empowers a cooperative approach between public and private stakeholders. A novel set of integrated solutions and "push-and-pull" demand oriented measures will be tested and shared in roadmaps for the implementation in European cities.
Solutions:

- Goods distribution by electric vehicles
- Subsidy program for electric trucks and vans
- Stimulate night deliveries
- Freight traffic routing
- Modal shift: electric boat, bike
- Broadening of time windows
- Low emission zones

Seven pilot experiments in six European countries ensure the applicability of the C-LIEGE approach: Bulgaria, Italy, Poland, United Kingdom, Germany and Malta.

6.1.5 ECOLOGISTICS

Objective: The Ecologistics project aims at reducing the access in the city centre of the more polluting commercial vehicles by developing new urban logistic strategies so to optimize the utilization of delivery cargo space and reducing the transit of empty commercial trucks, as well as promoting the use of low or zero pollution vehicles. By developing new urban logistic strategies so to optimize the utilization of delivery cargo space and reducing the transit of empty commercial trucks, as well as promoting the use of low or zero pollution vehicles, the Project has extensively reduced the access in the city centre of the more polluting commercial vehicles. The city logistics deals with local delivery of goods following an integrated and systemic approach with reference to the principles of sustainability and participate planning. (Infomobility Parma, 2011)
The so called EcoCity service is operational since April 2008 and uses specific storing warehouses and logistic platforms and a methane fuelled fleet of commercial vehicles equipped with GPS, GSM and Bluetooth technologies. The project has registered valuable performances in terms of reducing the transit of vehicles in the city centre (37.000 access less in respect to the previous year, -6%, 9 and the polluting emissions (37 Tons of CO_2 less per year). (Infomobility Parma, 2011)

6.1.6 ELCIDIS

ELCIDIS: Electric vehicle city distribustions systems.
Project duration: 1998-2002
Objective: The ELCIDIS project has tested a better solution for urban logistics by approaching the subject in a dual way, taking into account the interests of all parties involved, in order to set an example for clean and efficient urban distribution in the 21st century.

- By organising urban distribution using quiet and clean (hybrid) electric vehicles, the nuisance caused by distribution activities will be decreased. The improved living climate of the city will benefit residents and shoppers as well as shopkeepers.
- A more efficient organisation of urban logistics is achieved by more efficient routing of the vehicles and the use of urban distribution centres (UDC). This will decrease the number of journeys made by heavy vehicles and increase traffic fluidity in urban areas. The improved accessibility of the city will benefit transport companies, shopkeepers and businesses operating in the city.

6.1.7 FIDEUS

FIDEUS: Freight Intelligent Delivery of Goods in European Urban Spaces.
Project duration: 2005-2008, European Research Programme
Objective: The project investigated the development of a new urban logistics system using innovative vehicles and connected infrastructures geared to promoting improved vehicle use with in a context of urban (space and time) zoning.
Lyon was one of the three cities (together with Hanover and Barcelona) used as a testing arena for FIDEUS. The vehicle developed by Renault Trucks has been equipped with optimal features and functionalities designed from the perspective of the different players involved: transporter, driver, customer, infrastructure operator, «supervising» city authority.

6.1.8 FREILOT

FREILOT: Urban Freight Energy Efficiency Pilot
Project duration: 2009-2012
Objective: The FREILOT project aims at increasing energy efficiency of goods transport and CO2 emissions reduction through deployment of ITS (Intelligent Transport Systems) services.
This is done by achieving three challenging objectives:

- Showing quantifiable benefits to all relevant stakeholders
- Ensuring that FREILOT implementations continue after the pilot
- Extending the implementations to more cities and/or truck fleets

The FREILOT service includes the four elements:

- Traffic management - Energy efficiency optimised intersection control
- Vehicle - Acceleration limiter and adaptive speed limiter
- Driver - Enhanced “green driving” support
- Fleet management - Real-time loading/delivery space booking

Pilot cities: Bilbao (Spain), Lyon (France), Helmond (The Netherlands), Krakow (Poland)

6.1.9 INTERACTION

INTERACTION: INternational Transport and Energy Reduction ACTION - Energy efficiency equals cost efficiency: engaging sectoral organisations as champions and messengers to reduce energy use in freight transport.
Project duration: 2006-2008
Objective: The INternational Transport and Energy Reduction ACTION aimed to reduce energy consumption, CO_2-emissions and transport costs throughout the supply chain. The project was set up and carried out by energy agencies and specialised consultancies from 6 countries. A basic standard project approach (sectoral approach) has been developed which will be applied in each country in the sectors of industries. In each country energy reduction measures have been identified and implemented with companies in the (international) supply chain, focus was on shippers. Measures identified and implemented at individual companies comprised reduction of delivery frequency, adjustment of loading units, adjustment of vehicle technology, optimisation of planning systems, introduction of clean vehicles, etc. The objective: the

identification of best practices in sustainable energy reduction regarding freight transport, the international exchange of this knowledge and the creation of European awareness.

6.1.10 LEAN

LEAN: Introduction of LEAN LOGISTICS into urban multimodal transport management in order to reduce space requirements and optimise the use of transport modes.

Project duration: started with the European 4th Framework Programme1997-1999

Objective: Two concepts were developed in greater detail - load zone management and electronic logistic management. Load zone management is a system for automatic reservation of space in a city centre zone for loading and unloading lorries, supported by stricter enforcement of regulations to prevent illegal parking by private cars in that zone. It aims to reduce traffic jams due to parked cars and lorries blocking the street. A system was designed based on Internet access, making it available to a wide range of users without them needing special software. Messages would be transferred from the central reservations system to a display panel at the loading zone via the mobile phone network.

A logistic management system provides a basic structure for electronic data processing from source to destination along a logistic chain, to facilitate integrated planning, monitoring and control of the movement of goods. This can support the consolidation of goods into fewer vehicles. A prototype system was developed and tailored to the needs of a logistic service provider. The system was shown to manage the required tasks with full functionality.

6.1.11 MOSCA

MOSCA: Decision Support System For integrated Door to Door Delivery: Planning and Control in Logistics Chains.

Project duration: 2000-2003.

Objective: MOSCA aims at highly reducing several problems affecting freight distribution in European metropolitan areas, such as booking and reservation procedures, vehicle routing, loading/unloading areas reservations, emergency management support, effective and efficient multimodal inter-connection.

6.1.12 SMARTFREIGHT

SMARTFREIGHT: Smart Freight Transport in Urban Areas. SMARTFREIGHT is a research project co-funded by the European Commission under the Seventh Framework Programme for R&D, Theme 3 'Information and Communication Technologies'.

Project duration: 2008-2011

Objective: The SMARTFREIGHT project wants to make urban freight transport more efficient, environmentally friendly and safe by answering to challenges related to traffic management, freight distribution management, and a better coordination.

The objectives of the SMARTFREIGHT project are to:

Develop new traffic management measures towards individual freight vehicles through open ICT services, on-board equipment and integrated wireless communication infrastructure

- Assign different service levels to freight vehicles, depending on their environmental profile, type of goods transport and destination
- Grant priorities and access rights depending on the service level and traffic situation
- Allocate routes and times slots to freight vehicles to minimise conflicts and congestion
- Track and monitor vehicles carrying dangerous cargo
- Collect information for statistics
- Support control that enables enforcement
- Improve awareness in case of incidents

Improve the interoperability between traffic management and freight distribution systems

- Provide information that improves route planning for transport companies, such as more accurate transport network information, traffic and travel time information, through open ICT services

Coordinate all freight distribution operations within a city by means of open ICT services, on-board equipment, wireless communication infrastructure and CALM MAIL implementation in on-board and on-cargo units, for all freight vehicles

- Routing and re-routing for scheduled freight and service vehicles
- Provide information that improves the efficiency of these fleets
- Manage the use of loading and unloading areas
- Track freight vehicles
- Track cargo
- Monitor the status of cargo

6.1.13 START

START: Short Term Actions to Reorganize Transport of goods

Project duration: 2006-2009. START is co-financed by the Intelligent Energy Programme STEER.

Objective: START deals with making goods distribution more energy efficient by combining access restrictions, incentives and the development of consolidation centres. The project is coordinated by the city of Göteborg. The cities of Bristol, Göteborg, Ljubljana, Ravenna and Riga are together with local partners introducing and developing measures that will benefit both businesses and citizens by making goods distribution more energy efficient and hence reducing the related air pollution.

6.1.14 STRAIGHTSOL

STRAIGHTSOL: Strategies and measures for smarter urban freight solutions

Project duration: 2011 – 2014 EU-funded project

O**bjectives**:

- Develop a new impact assessment framework for measures applied to urban-interurban freight transport interfaces.
- Support a set of innovative field demonstrations showcasing improved urban-interurban freight operations in Europe.
- Apply the impact assessment framework to the live demonstrations and develop specific recommendations for future freight policies and measures.

STRAIGHTSOL will contribute to the Commission's research agenda through: 1) an implementation of sustainable urban-interurban freight transport solutions, 2) widely disseminating the experiences and effects from the demonstrations amongst the logistics community, 3) demonstrating the added value of the evaluation tool framework for assessing last mile distribution and urban-interurban freight activities.

6.1.15 SUGAR

SUGAR: Sustainable Urban Goods Logistics Achieved by Regional and Local Policies

Project duration: 2008-2012

Objective: SUGAR focuses on addressing the problem of inefficient and ineffective management of urban freight distribution. To accomplish this goal, the projects promotes the exchange, discussion and transfer of policy experience, knowledge and good practices through policy and planning levers in the field of urban freight management, between and among Good Practice and Transfer sites.

6.1.16 TRAILBLAZER

TRAILBLAZER: Transport And Innovation Logistics By Local Authorities with a Zest for Efficiency and Realisation.

Project duration: 2011 – 2013
Objective: The TRAILBLAZER project will run until June 2013 and aims to promote Delivery and Servicing Plans (DSPs) across Europe. DSPs are key strategy documents that manage deliveries more effectively and reduce numbers of journeys.
The advantages include:

- Reduced emissions
- Reduced delivery costs and improved security
- More reliable deliveries and less disruption to the working day
- Time saved as you identify unnecessary deliveries
- Less noise and intrusion
- Opportunity to feed into a corporate social responsibility (CSR) programme and ensure your operations comply with health and safety legislation

6.1.17 TURBLOG

TURBLOG_WW: Transferability of urban logistics concepts and practices from world wide perspective.
Project duration: 2009-2011
Objective: TURBLOG_WW is EU supported project under the FP7 Programme designed from a complementary perspective for the work that is being promoted at the EU level by the BESTUFS network, by addressing urban logistics from a wider (geographical) perspective, focusing upon a worldwide level (in general) and on Brazil and Peru (in particular). The main goal of the project is to extend, expand and transfer the existent knowledge to other countries and thus effectively contribute for the overall objective of extending the research and knowledge dissemination between EU and Latin America.

6.2 Other projects

6.2.1 ADVANCE

ADVANCE: Auditing and Certification Scheme to Increase the Quality of Sustainable Urban Mobility Plans in Cities.
Project duration: 2011-2014. Developed by public authorities and 8 city partners.
Objectives: ADVANCE will develop, test and apply an Audit Scheme to help cities set up and improve the quality of Sustainable Urban Mobility Plans and policies. ADVANCE focusses on supporting cities without an integrated Sustainable Urban Mobility Plan or with a focus on infrastructure measures to solve mobility problems. For cities, which have already a Sustainable Urban Mobility Plan, the ADVANCE Audit scheme identifies potential areas for further improvements. After a validation and improvement phase eight cities will be guided through the ADVANCE Audit Scheme and devise eight local action plans. These plans will raise awareness among local decision makers about the correlation between energy efficiency and transport. Cities that have gone through the audit process and committed themselves to the action plan, will receive an ADVANCE certificate.
At this stage it is not possible to describe the ADVANCE Audit Scheme in detail. The prototype ADVANCE Audit Scheme will be developed until November 2012.

6.2.2 BESTFACT

BESTFACT: Best Practice Factory for Freight Transport.
Project duration: 2012-2015. Developed by public authorities and private partners.
Objective: The objective of BESTFACT is to develop, disseminate and enhance the utilisation of best practices and innovations in freight logistics that contribute to meeting European transport policy objectives with regard to competitiveness and environmental impact. A short survey related to strategic targets and challenges in freight transport is running until 30th April 2012.

6.2.3 BESTLOG

BESTLOG: Collection and dissemination of logistics best practices.
Project duration: 2006 - 2010. ELABestLog project from 2010.
Objective: One major task in this project was the collection and dissemination of logistics best practice. The project team has handed over to ELAbestLog the community for logistics best practices under the roof of the European Logistics Association.

6.2.4 CITY MOVE

CITYMOVE Multi-role Optimized Vehicle.
Project duration: 2010-2013. Consortium of public and private partners.
Objective: CITYMOVE aims to integrate new technologies into an urban multi-role solution in an interoperable environment bringing to a significant breakthrough increasing in terms of efficiency and safety (in-vehicles) and reduction in CO_2 emissions.

6.2.5 CLIMATE SMART CITY DISTRIBUTION

Project duration: 2010 – 2012.
Objective: The project aims at developing and demonstrating more effective and eco-friendly solutions for city distribution. The objective is to reduce the climatic impact from distribution traffic within the city of Goteborg's environmental zone by 50 % (for the vehicle fleet of the participating shipping companies). This objective is realised by the introduction of energy-efficient vehicle technology, renewable fuel and new solutions for freight coordination and consolidated shipment.
Participants of the project are freight delivery companies, fuel suppliers and vehicle manufacturers, Swedish Transport Administration and the region of Göteborg.
The project will demonstrate and introduce:

- Trucks with methane-based diesel technology
- Trucks with hybrid technology
- A greater proportion of light distribution vehicles running on vehicle gas in central Göteborg
- New solutions for more efficient city distribution leading to reduces traffic

Final compilations and calculations will be made during the second half of 2012.

6.2.6 CONNECTED CITIES

Objective: The Clear Zones aim is to use partnership working between Central London Authorities to reduce congestion, air and noise pollution and improve the urban realm. The Clear Zone Partnership (CZP) uses innovative technologies and sustainable transport measures to achieve this aim. The partners are the City of London, City of Westminster and Camden Council.
Several initiatives were taken:

- Delivery time restrictions
- Alleviation of routing and access issues
- Measures to reduce pollution by HGV vehicles
- Incentives to reduce noise levels
- Establishment of consolidation centres

6.2.7 DELIVER

DELIVER: Design of Electric Light Vans for Environment-impact Reduction
Project duration: 2011-2014
Objective: The DELIVER project serves the purpose of exploring and identifying conceptual design options for fully electric light commercial vehicles in urban areas. The project partners, which bundle different

competence fields throughout Europe, make it their task to develop and build-up in hardware an innovative and sustainable vehicle concept that fulfils the demands of tomorrow.

6.2.8 ECOMOBILITY SHIFT

Project duration: 2010 - 2013.
The project is co-funded by Intelligent Energy Europe (IEE) program.
Objective: EcoMobility SHIFT is a total quality management scheme that allows cities to assess their current "EcoMobility" performance, establish a path of continuous improvement, and audit (verify) performance to receive a Label. In the long term, involvement in SHIFT will help cities to effectively achieve better and more sustainable transport, health, social, economic and environmental systems.
The EcoMobility SHIFT project aims at developing a method to assess, improve and promote the environmental sustainability of local governments' transport and land-use planning policies. Municipalities will be able to obtain an 'EcoMobility Label' that values their efforts to improve the 'friendliness' of their cities, neighborhoods and facilities for pedestrians, cyclists, wheelers and public transport users.

6.2.9 ECOSTARS

ECOSTARS Fleet recognition schemes
Project duration: 2011-2014
Objective: ECOSTARS Europe promotes more efficient and cleaner freight and passenger transport vehicle movements by providing recognition, guidance and advice to operators of vehicle fleets.
ECOSTARS Europe strategic objectives are:

- to increase the energy efficiency of freight distribution by giving recognition and publicity to transport operators using sustainable practices in their procurement and management processes;
- to encourage the faster introduction of vehicles using clean fuel technologies;
- to encourage the development of energy efficient driving schemes and operational management practices;
- to promote the auditing and certification of freight operators using a Europe-wide approach to sustainable practices in freight operations.

ECOSTARS EUROPE will set up seven Fleet Recognition Schemes in 6 countries in 2012, and support the continued development of the original ECOSTARS scheme in South Yorkshire, in the United Kingdom.

6.2.10 FREIGHTWISE

FREIGHTWISE: Management Framework for Intelligent Intermodal Transport.
Project duration: 2006-2010
Objective: FREIGHTWISE is an integrated project within the EU's 6th Framework Programme that aims at bringing together three different sectors:

- Transport Management: Shippers, Forwarders. Operators and Agents;
- Traffic and Infrastructure Management: Rail, Road, Sea, Inland waterways;
- Administration : Customs, Border Crossing, Hazardous Cargo, Safety and Security

FREIGHTWISE's overall objective is to support the modal shift of cargo flows from road to intermodal transport using road in combination with short sea shipping, inland waterways and rail. It achieves this objective by means of improved management and facilitation of information access and exchange between large and small, public and private stakeholders across all business sectors and transport modes.

6.2.11 HOST

HOST: Human Oriented Sustainable Transport mean.
Project duration: 2005 – 2007

Objective: The HOST project aims at developing a multipurpose transport mean. Due to the modularity of the chassis and powertrains, HOST is capable of being equipped with a variety of bodies, providing new services for mobility and goods displacement in towns, and organising urban motorised traffic in a more rational way.

6.2.12 ICARGO

ICARGO: Intelligent Cargo in Efficient and Sustainable Global Logistics Operations
Project duration: 2011-2015
Objective: Advancing and extending the use of ICT to decarbonise co-modal logistics

- Dynamic planning capabilities: synchronise modes and vehicles movements, terminal operations and warehousing
- Supporting increased load factor for all modes
- Enhance intermodal transport reliability and accuracy through real-time information
- Optimise environmental performance and assess the effects of Low CO_2 transport choices

6.2.13 PROMIT

PROMIT: Promoting Innovative Intermodal Transport.
Project duration: 2006-2009. PROMIT was a Coordination Action funded by the European Commission, under the 6th Framework Programme.
Objective: PROMIT is a European Coordination Action for intermodal freight transport initiating, facilitating and supporting the coordination and cooperation of national and European initiatives, projects, promotion centres, technology providers, research institutes and user groups related to this most complex transport form. The strategic PROMIT objective is to contribute to a faster improvement and implementation of intermodal transport technologies and procedures and to help promoting intermodal logistics and mode shift by creating awareness on innovations, best practices and intermodal transport opportunities for potential users as well as for politicians and for the research community. The project implementation covers a 3-year period, where 3 Intermodal Innovation Day Conferences and at least 15 cluster Workshops will be organised in addition to the dissemination via brochures, newsletter and Internet homepage. PROMIT will raise synergies in the European intermodal community and contribute to policy initiatives on national and European level supporting the shift of transports from road to Intermodal transport modes.

6.2.14 SMARTFUSION

SMARTFUSION: Smart Urban Freight Solutions
Project duration: starts in 2012. Coordinated by POLIS
Objective:

- Enhance the innovation process at urban-interurban interfaces
- Demonstrate and evaluate the technical and logistical feasibility of introducing electric vehicles and second generation of hybrid truck technologies in conjunction with information technology and operational, managerial and regulatory systems
- Develop a Smart Urban Designer tool to allow other city-regions and companies to analyse their likely sucess and benefits of applying these innovations in their domain
- Enhanced Transfer Programme (coordinated by POLIS)

7 References

7.1 Projects

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BESTLOG – ELABESTLOG. http://www.bestlog.org/index.php?id=5

BESTUFS: Best Urban Freight Solutions. http://www.bestufs.net/

CITYLOG: Sustainability and efficiency of City logistics. http://www.city-log.eu/

CITYMOVE Multi role optimized Vehicle. http://www.citymoveproject.eu/

CIVITAS: Cleaner and Better Transport in Cities. http://www.civitas-initiative.org/index.php?id=69

C_LIEGE: Clean Last mile transport and logistics management. http://www.c-liege.eu/

CLIMATE SMART CITY DISTRIBUTION. http://www.climatesmartcitydistribution.com/

CONNECTED CITIES. http://www.connectedcities.eu/showcases/clear_zones.html

DELIVER: Design of Electric Light Vans for Environment-impact Reduction http://www.deliver-project.org

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ECOMOBILITY SHIFT. http://www.ecomobility-shift.org/home/

ECOSTARS: Fleet recognition scheme. http://ecostars-europe.eu/en/About/About-the-project/

ELCIDIS: Electric Vehicle Distribution Systems. http://www.elcidis.org/

FIDEUS: Freight Intelligent Delivery of Goods in European Urban Spaces.
http://www.fleetrunner.net/FRCommon/fideus_overview.htm
Video: http://www.youtube.com/watch?v=02n9UndbZbE

FREILOT: Urban Freight Energy Efficiency Pilot http://www.freilot.eu/

FREIGHTWISE: Management Framework for Intelligent Intermodal Transport.
http://www.freightwise.info/cms/

HOST: Human Oriented Sustainable Transport mean.
http://ec.europa.eu/research/transport/projects/items/host_en.htm

iCARGO: Intelligent Cargo in Efficient and Sustainable Global Logistics Operations http://www.i-cargo.eu

INTERACTION: INternational Transport and Energy Reduction ACTION. http://www.eaci-projects.eu/iee/page/Page.jsp?op=project_detail&prid=1620&side=projectbrief

LEAN: Introduction of LEAN LOGISTICS into urban multimodal transport management in order to reduce space requirements and optimise the use of transport modes. http://www.transport-research.info/web/projects/project_details.cfm?id=471&backlink=%2Fweb%2Fcommon%2Fsearch%2Ecfm&referer=y%2A0%7Cx%2A0%7Csearchstring%2ALEAN%20logistics

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SUGAR: Sustainable Urban Goods Logistics Achieved by Regional and Local Policies http://www.sugarlogistics.eu

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