

8th International Conference on City Logistics

City Logistics in the European CIVITAS Initiative

Tariq van Rooijen^{a*}, Hans Quak^a

^aTNO, Van Mourik Broekmanweg 6,2628 XE Delft, the Netherlands

Abstract

This paper discusses the developments of city logistics in the CIVITAS initiative. CIVITAS is a large European Commission co-funded program to support sustainable urban mobility. Urban freight logistics is one of eight CIVITAS clusters by which cities aim to improve sustainability in their cities. During the last decade the CIVITAS initiative resulted in 53 innovative urban freight logistics measures that have been implemented and evaluated in European cities. This contribution presents the different measures and their outcomes. The overall conclusion is that partnerships between urban freight logistics stakeholders are essential in making the measure a success.

© 2014 The Authors. Published by Elsevier Ltd. Open access under [CC BY-NC-ND license](https://creativecommons.org/licenses/by-nc-nd/4.0/).

Selection and peer-review under responsibility of the Organising Committee of the 8th International Conference on City Logistics.

Keywords: Sustainable urban mobility; policy; measures; pilots; urban freight transport; evaluation; city logistics

1. The Challenge of Sustainable Urban Mobility

European cities are facing enormous challenges in terms of accessibility and livability. Congestion levels are still increasing. Air pollution and noise disturbs many lives and the desire to live in some of the (inner) cities is decreasing for these reasons. Today transport accounts for around one-quarter of EU CO₂ emissions. Scenarios of the European Commission based on unchanged policy and a yearly economic growth between 1.2% and 2.2% show an increase of the personal transport of 51% and of freight transport of 82% in the EU in the period 2005-2050 (European Commission, 2011a).

* Corresponding author. Tel.: +31 88 866826

E-mail address: tariq.vanrooijen@tno.nl

Freight transport in urban areas is a longstanding problem. It is essential to the success of cities and conflicts with other demands, such as for example flowing traffic, livable urban environment, pedestrian and cyclist comfort.

The European Commission's Transport 2050 Strategy proposes a target of 60% greenhouse gas emission reduction by 2050. It sets goals for the different modes of transport, including CO₂-free city logistics in major urban centres by 2030 (European Commission, 2011b).

2. Objectives and Brief History of CIVITAS

One of the large EU initiatives in the area of sustainable urban mobility is the large scale co-funding CIVITAS Initiative ('City-Vitality-Sustainability'). The fundamental aim of CIVITAS, which started in 2002, is to contribute to a change towards sustainable urban mobility by (Lindt & Emmert, 2013):

- promoting and implementing sustainable, clean and (energy) efficient urban transport measures;
- implementing integrated packages of technology and policy measures;
- building up critical mass and markets for innovation;
- overcome barriers for implementation of innovative and ambitious measures and policies by experimental testing combined with targeted research.

To reach this, the European Commission funded 180 of the 250 million euro total budget of the first three editions of the CIVITAS initiative.

Within CIVITAS cities are seen as living laboratories for conducting innovative urban sustainability measures. Therefore, learning from the measures is extremely important within the initiative and much attention is paid to the monitoring and evaluation of the measures. All monitoring and evaluation activities are supported by an independent consortium of experts providing support to the demonstration projects in the field of monitoring and evaluation, but the cities are responsible for conducting the evaluation.

There are two different kinds of evaluation in CIVITAS: an impact evaluation and a process evaluation. The first one is more quantitative oriented and consists of a framework with thirty indicators in five categories (economy, energy, environment, society and transport) in which impacts are measured. The aim of the process evaluation is to gain insight into the barriers that hamper or the drivers that stimulate the preparation, implementation and operation of the measures, as well as in the actions undertaken regarding these barriers and drivers. In this process of evaluation special attention is paid to 'the stories behind the figures' (Rooijen et al, 2012).

The CIVITAS initiative contained several editions over the last decade, see Table 1. Each edition consists of a number of demonstration projects in which the demonstration cities are gathered together that share similarities in city characteristics or in the kind of measures they implement.

Table 1. The different CIVITAS editions

Edition	Running time	Demonstration Cities
CIVITAS I	2002-2006	Barcelona, Cork, Winchester, Roma, Rotterdam, Berlin, Göteborg, Gdynia, Bukaresti, Nantes, Bristol, Bremen, Kaunas, Aalborg, Lille, Praha, Graz, Stockholm, Pécs
CIVITAS II	2005-2009	Preston, La Rochelle, Ploiesti, Genova, Kraków, Burgos, Stuttgart, Toulouse, Debrecen, Venezia, Odense, Ljubljana, Norwich, Suceava, Potenza, Malmö, Tallinn
CIVITAS PLUS	2008-2013	Aalborg, Brighton & Hove, San Sebastian, Iasi, Monza, Usti-nad-Labem, Ljubljana, Gent, Zagreb, Porto, Brno, Bologna, Funchal, Utrecht, Gdansk, Tallinn, Craiova, Brescia, Coimbra, Vitoria-Gasteiz, Perugia, Bath, Gorna-Oryahovitsa, Szczecinek, Skopje
CIVITAS PLUS II	2012-2016	Brno, Tel-Aviv, Malaga, Stuttgart, Aachen, Palma de Mallorca, Koprivnica, Gdynia

Fig. 1 shows a map with the spread over Europe of all cities that are actually implementing or implemented in the past sustainable urban mobility measures within the CIVITAS initiative. Besides the demonstration cities there are also a large number of CIVITAS network cities. 250 cities have joined the CIVITAS network and participate in

events to learn from the experiences of the demonstration cities. These are cities that are similarly committed to introducing ambitious, clean urban transport strategies but have not yet participated in the initiative.



Fig. 1. The CIVITAS demonstration cities (civitas.eu, 2012)

In each edition a large number of sustainable transport measures has been implemented. These measures are clustered in eight different thematic categories of measures:

- (1) clean fuels and vehicles
- (2) collective passenger transport
- (3) demand management strategies
- (4) mobility management
- (5) safety and security
- (6) car independent lifestyles
- (7) urban freight logistics
- (8) transport telematics

In this paper we focus on urban freight logistics (CIVITAS cluster number 7).

3. City Logistics in CIVITAS

In CIVITAS a large number of innovative urban freight logistics measures were developed to try to tackle the problems caused by freight deliveries and pickups in the cities. These measures aimed at increasing the efficiency of vehicles, reducing traffic congestion and the reduction of environmental impacts due to freight delivery in cities. The measures have shown some valuable insights into the time-frames and conditions needed for freight solutions within various European cities. The demonstrations of urban freight logistics show some positive results to build on, however concrete results seem to be limited in comparison to the other clusters, and still a great deal remains to be improved and taught about how to successfully implement an Urban Freight Logistic Measure (UFLM) in order to improve urban sustainability. We will have a look at the outcomes of UFLMs in the three editions that are already finished. First, we describe the general outcomes per edition of the first two editions (I and II), before describing the outcomes of the urban freight logistics measures of CIVITAS PLUS in detail.

3.1. CIVITAS I

In CIVITAS I (2002-2006) there were seventeen measures in eleven cities related to city logistics, which can be found in table 2. This table shows the city in which the measure is implemented (or at least where it is tried), the title of the measure, and the degree of success. The degree of success of implementation is either successful (which implies the measure is implemented as planned), moderately successful (which means the measure is not implemented as planned due to unforeseen circumstances, but based on the lessons learned during attempts to implement a new (slightly) changed measure was put in practice), or not successful, which implies that the measure was (due to unexpected problems or opposition) not implemented.

Table 2. Overview UFLM CIVITAS I (CIVITAS Meteor, 2006)

City	Measure(s) title	Success of implementation (per city)
Barcelona	-New concepts of distribution of goods	Successful
Berlin	-Inner city logistics centre -Financing contract for CNG vehicles	Successful
Bremen	-City logistics scheme/freight village	Not successful
Bristol	-City logistics scheme/Clean goods -Freight loading/Signing strategies -Community delivery points	Successful
Göteborg	-Incentives for improving the load factor in inner-city freight transport -Consumer driven goods management from a mobility centre base	Successful
Graz	-Distribution of goods/Green city logistics	Moderately successful
Nantes	-Distribution of goods	Not successful
Rome	-Kerbside-doorstep delivery	Not successful
Rotterdam	-E-commerce logistics -Multi core tube logistics	Moderately successful
Stockholm	-Material logistic centre to optimise freight deliveries at construction sites -Logistic centre for the old town	Successful
Winchester	-Sustainable urban distribution	Moderately successful

The main topics of this cluster were:

- Bundling of goods delivery, including:
 - the use of an inner city logistics centre (a city distribution center);

- use of permits for certain types of delivery vehicles and restrictions for other types;
- promotion of contact between companies to stimulate bundling.
- Guided routes for goods delivery;
- Use of clean vehicles.

In this first edition of CIVITAS the focus was mainly on the implementation of the measures. Half of the measures were successfully implemented. Certain measures suffered delays or were only partly implemented during the project period due to the fact that the realisation of the logistics centre where the measures were to take place was delayed. Measures using clean vehicles could not be implemented everywhere as the desired clean CNG trucks were not available. Compared with other thematic clusters there were less measures implemented.

Evaluation was not as developed in this first edition as it became in later ones. Only two cities could present quantitative outcomes on the impact evaluation in this cluster (Stockholm and Göteborg). Measures about setting up logistics centres lead to fewer trips and as a result fewer negative impacts.

The process evaluation underlined the need for broad cooperation among all the stakeholders concerned in order to establish common objectives and to avoid a possible imbalance of competitive advantages. Political commitment was seen as essential because the measures influence the local private sector, making political backing important.

3.2. CIVITAS II

The seventeen measures of CIVITAS II (2005-2009) divided in 3 sub-clusters within the category of urban freight logistics are shown in the table below:

Table 3. Overview UFLM CIVITAS II (McDonald et al, 2010)

City	Measure title	Success of implementation
New distribution schemes (8 measures)		
Burgos	New goods distribution scheme	Moderately successful
Genoa	Enlarged goods distribution scheme	Moderately successful
Krakow	New goods distribution scheme	Moderately successful
La Rochelle	City logistics strategic extension	Successful
La Rochelle	Customer services associated with goods distribution	Very successful
Norwich	Urban consolidation centre	Not successful
Norwich	Goods delivery to Park & Ride sites	Successful
Toulouse	Clean urban logistics and goods distribution platform	Moderately successful
Vehicle and driver support (6 measures)		
Malmö	Freight driver support	Not successful
Malmö	Sustainable SME logistics for the food industry	Not successful
Norwich	Customised traffic and travel information service for freight operators	Not successful
Ploiesti	Freight partnership, planning, routing, signing	Moderately successful
Preston	Freight routing and signing	Successful
Venice	Clean Urban Logistics	Very successful
Freight partnerships (3 measures)		
Norwich	Development of Strategic Freight Stakeholders Club	Not successful
La Rochelle	Development of partnership with logistic operators	Moderately successful
Preston	City logistics partnerships and strategic planning	Successful

The evaluation showed that the urban freight logistics measures were not that successful. Urban freight logistic measures were given the label ‘measures with a high failure rate’. In five measures an urban distribution centre was planned but only one was partly realised, mainly due to the opposition of local businesses. Also only one measure succeeded in using clean vehicles, although this was planned in more cities. The main evaluation findings in CIVITAS II on the urban freight logistics measures were (McDonald et al, 2010):

- Without partnerships between businesses, operators and authorities, measures to promote effective and sustainable logistics measures are not likely to succeed. Relationship building takes time.
- Original plans within these measures to develop urban delivery or consolidation centers may have been overly optimistic, and were not achievable during the life of the project.
- Introducing clean vehicle technologies is likely to result in substantial savings in fuel costs and reductions in emissions, but associated set-up costs and other technical problems may result in resistance from potential stakeholders.
- Other innovative methods of promoting efficient goods distribution, such as the use of bus lanes for certain freight vehicles, are also likely to encounter local resistance, although suitable promotion and awareness raising could help to reduce this.
- Innovative distribution platforms based in Park and Ride facilities may only be profitable to run during busy shopping periods.

Recommendations that arose from the evaluation focus on the partnerships that need to be developed as early as possible in the planning process between the stakeholders to identify common goals and enable problems to be recognized. These partnerships and consultations can help to understand the requirements of freight and business operators.

3.3. CIVITAS PLUS

Before the end of CIVITAS II the next edition started; CIVITAS PLUS (2008-2013). The 19 urban freight logistics measures of CIVITAS PLUS have been divided into 4 main sub-clusters as shown in the table below:

Table 4. Overview UFLM CIVITAS PLUS

City	Measure title	Code
Freight partnerships (4 measures)		
Ghent, Zagreb, Ljubljana, Porto	Integrated freight policy development	FP1
Brighton, Iasi, San Sebastian	Freight Quality Partnerships (FQP)	FP2
Brighton	Efficient goods distribution	FP3
Iasi	Efficient goods distribution	FP4
New distribution schemes (9 measures)		
Ljubljana	Sustainable freight logistics	NDS1
San Sebastian	Efficient goods distribution	NDS2
Utrecht	Construction Logistics Plan	NDS3
Utrecht	City Distribution by Boat	NDS4
Utrecht	Distribution Centres for Fresh and Perishable Goods	NDS5
Utrecht	Merchandise Pick-up Points	NDS6
Perugia	Pipenet	NDS7
Bath	Urban freight logistics, new concepts for goods distribution	NDS8
Vehicle and driver support (2 measures)		
Tallinn	Marking routes for smooth freight and city logistics	VDS1

Utrecht	Clean Route Planning for Freight Transport	VDS2
Access restrictions to freight vehicles (5 measures)		
Zagreb	Freight delivery restrictions	AR1
Aalborg	Efficient goods distribution	AR2
Utrecht	More flexible access for cleaner freight traffic	AR3
Bologna	City freight delivery plan	AR4
Brescia	Freight distribution	AR5

The outcomes of the CIVITAS PLUS measures will be described below in more detail than the outcomes of the previous two editions. Some interesting measures will be highlighted:

3.3.1. (FP1) *Integrated freight policy development in Ghent, Ljubljana, Zagreb and Porto*

Both in the cities of Ghent, Ljubljana and Zagreb the efforts to bring stakeholders together when drafting an integrated freight policy resulted finally in a basis for future cooperation. However, in Porto the efforts failed in getting no real response. In all the cities the main barriers were the different stakeholder interests. In Zagreb, after many failures, finally a new plan for a local freight partnership was prepared which also included a detailed action plan for stakeholder involvement and on promotion activities. In Ghent the resistance against policy-based solutions for the distribution of goods was turned into a positive cooperation in a partnership through initiatives to solve specific distribution problems, like the implementation of a new type of (un)loading spots. In Ljubljana the partnership was strengthened through a web portal (Engels et al, 2012).

3.3.2. (FP2) *Freight Quality Partnerships (FQP) in Brighton, San Sebastian and Iasi*

In Brighton, San Sebastian and Iasi FQP were used to accompany the city logistic measures in these cities that are described below (FP3 and 4, NDS2). In all cases, stakeholder involvement was essential when logistic activities were considered. Although FQP appear as the ideal tool, the results achieved in this regard within these cities have revealed its complexity, given the numerous and diverging interests and views that should be embraced by it. As demonstrated in Iasi, the FQP needs incentives and practical projects that have clear and direct impacts for businesses to initiate its activity and drive engagement, i.e. one step further than simple dialogue or exchange of ideas (Velazquez Valoria et al, 2013).

3.3.3. (FP3) *Efficient goods distribution in Brighton & Hove*

In Brighton a busy street in the city centre with more than 350 business and small companies was the subject of partly pedestrianised which reduced the impact of freight traffic. The number of light goods vehicles decreased by 13%, heavy goods vehicles by 6% and traffic in general by 42%. Pedestrian numbers increased at weekdays by 66% and at weekends by 24%. Satisfaction levels amongst local business increased by 7%. The partial pedestrianisation scheme was successful in reducing freight movements. However its acceptance by local businesses only occurred due to prolonged dialogue with them and many amendments to the scheme (Velazquez Valoria et al, 2013).

3.3.4. (FP4) *Efficient goods distribution in Iasi*

To optimise traffic flows in Iasi an outcome of the FQP was to implement two time windows, i.e. one in the early morning and one in the afternoon, outside peak hours for freight vehicles. The companies that joined were awarded benefits like tax reductions and better parking facilities. The number of goods distribution vehicles decreased at peak hours after the measure was implemented. From 109 vehicles in 2009, to 41 in 2011 and 33 in 2012, leading to better traffic throughput. Outside the peak hours the number of freight vehicles increased as a result of the measure (Velazquez Valoria et al, 2013).

3.3.5. (NDS1) *Sustainable freight logistics in Ljubljana*

This measure consisted of two parts: setting up a consolidation scheme and starting a web portal. As there was no implementation, the impact of a consolidated freight scheme was only modeled. Important reductions can be expected in emissions, freight movements, kilometers driven and fuel consumption, when goods deliveries are consolidated and delivered by electric vehicles. The web portal provided online routing tools (Engels et al, 2012).

3.3.6. (NDS2) *Efficient goods distribution in San Sebastian*

In San Sebastián, they combined an urban consolidation centre with the use of clean vehicles (e.g. electric cargo bikes) for goods distribution in the last mile in the inner city. This approach led to a significant reduction in terms of consumption as well as to emission savings. Since this option is only suitable within a limited radius of operation and for certain types of freight, this kind of scheme should be complemented by other measures aimed at increasing the efficiency in logistic operations in order to be able to serve the whole city (Velazquez Valoria et al, 2013).

3.3.7. (NDS3) *Construction Logistics Plan (CLP) in Utrecht*

Between 2010 and 2019 the central railway station area in Utrecht is planned for reconstruction. This implies additional traffic volume which is increasing the usual traffic flow in the city centre. At the peak of the construction activities, it is estimated that 250 trucks will drive to and from the central railway station area every day. The main idea behind this measure was that the construction materials should not be delivered directly to the construction sites in the city centre, but to one central transfer site. From there different materials and deliveries would be combined into complete freights. The construction logistics centre (CLC) was planned to be implemented near Utrecht Central Station. A market consultation has been performed, leading to the CLP, several locations for the CLC have been identified. One of the main construction companies in the station area is involved in the project; however the CLC was not used within the CIVITAS period yet. The implementation was delayed due to delayed construction works. Notable was that especially among construction companies there was limited problem awareness as freight issues were considered as solvable ‘on the job’. Therefore their willingness to participate in a construction logistics plan or use a CLC was low. The efforts invested to establish a continuous and constructive dialog between the companies involved in the implementation of the CLC appeared as the main driver of the measure. The companies were not enthusiastic about the idea of a comprehensive logistic concept and the dialogue allowed companies to understand the benefits of it and contributed to gain their interest for the concept during the process (Riedel et al, 2013).

3.3.8. (NDS4) *City Distribution by Boat (beer boat) in Utrecht*

In Utrecht there has already been some transport by water through the City’s canals. In this measure it was decided to expand the existing water transport with the introduction of a zero-emission electric vessel to transport goods to clients, shops, bars and restaurants in the city centre. The concept is known as the Beer Boat, which is currently operating 6 times on 4 days per week, supplying more than 60 catering businesses. Notice in the picture below that these premises are ideally located for deliveries over water as there are unique low quays next to the Utrecht canals.



Fig. 2. The Beer Boat (Riedel et al, 2013)

The key-results of the impact evaluation were the reduction of CO₂ emissions by more than 38 tonnes, NO_x emissions by 31kg and PM10 emissions by 6kg. For the total estimated city centre emissions this means a decrease in CO₂ emissions of 13%, NO_x emissions by 6% and PM10 emissions by 10% in the project lifespan. In addition, the CBA concerned the entire Beer Boat lifespan of 30 years and mainly focused on implementation- and operating costs, revenues and emission effects. Overall, the Beer Boat measure is yielding a net present value (NPV) of well over €420.000 at a 3.5% discount rate.

As a result of the electric Beer Boat, in April 2012 the city launched another electric Multi-Purpose Vessel, called the 'Ecoboot'. This Vessel replaced the existing garbage boat which had been running in Utrecht to collect garbage from businesses on the wharves (Riedel et al, 2013).

3.3.9. (NDS5) *Distribution Centres for Fresh and Perishable Goods in Utrecht*

Catering goods are usually delivered several times a week which increases the freight traffic in the inner-city. The measure seeks to elaborate and implement a sustainable catering delivery service in Utrecht. The concept is based on bundling fresh and perishable goods in an Urban Distribution Centre and using cleaner freight transport vehicles for the distribution.

However the interest for the measure among the stakeholders in the city centre was insufficient to start the pilot project. Efforts had been invested to encourage them to participate, raise their awareness and especially to identify reliable partners to implement the pilot project. Finally a transport company, Hoek Transport, was interested in conducting a pilot project in 2013 in the whole city centre with their Cargohopper (described further on) with an extra cooling unit for the Fresh and Perishable Goods. This pilot is now a private initiative and no longer directed by the municipality (Riedel et al, 2013).

3.3.10. (NDS6) *Merchandise Pick-up Points (MPuP) in Utrecht*

The idea behind this measure was to reduce private car traffic in the inner-city without affecting the business of shopkeepers located in the city. This calls for a situation in which it is no longer necessary to go to the city centre by car to purchase (heavy or large) goods and it was hoped that a MPuP would facilitate more rational travel mode choices. The MPuP is a storage location outside the historic centre of Utrecht, addressed to individual private customers who purchase heavy goods from shopkeepers located in the inner-city. Also shopkeepers could use it as storage location for their goods. The measure was cancelled after the feasibility study in which shopkeepers said they were satisfied with the current system. Only 5% of all visitors who participated in the questionnaire came to the city centre to buy heavy goods. Half of them say they are willing to use an MPuP. The demand for a MPuP did not justify its implementation (Riedel et al, 2013).

3.3.11. (NDS7) *Pipenet Perugia*

A feasibility study was conducted on a pipeline system in the old city of Perugia. A cost benefit analysis has been performed, showing the potential of the project in terms of a positive NPVs obtained by less expected noise nuisance, less air pollution, a reduction in trafficcongestion and more energy efficiency. Further studies will be conducted before a potential implementation will take place (civitas.eu, 2012).

3.3.12. (NDS8) *Urban freight logistics, new concepts for goods distribution in Bath*

This measure established an urban freight consolidation centre to serve Bath, with the aim of reducing the number of goods vehicle deliveries to businesses in the city. Given that many of the deliveries into central Bath are made by heavy goods vehicles, these trips have a major impact on the city centre environment, in terms of vehicle emissions as well as contributing to traffic congestion.

DHL established the Bath consolidation centre at their depot, close to the M5 Motorway near Bristol from where they also operate a freight consolidation scheme for Bristol, in December 2010. Goods are consolidated for onwards dispatch in pre-arranged time slots using low emission/low carbon 'Smith Newton' 9 tonne electric delivery vehicles into central Bath. The service was free to businesses in Bath for an initial period of 15 months, after which a cost of £9 per cage and £12 per pallet was charged to participating businesses. The contractor DHL

marketed the scheme to 140 businesses in Central Bath during the demonstration project of which 19 joined the scheme.

The use of the electric truck helped reduce CO₂ and other pollutant emissions, by avoiding a number of trips to Bath that would have taken place by diesel-powered trucks and vans. The electric vehicle used by the Consolidation Centre achieved a 56% reduction in energy consumption compared to an equivalent diesel truck. From January 2011 to end of April 2012 the number of delivery journeys into Bath was reduced by 1,016 and on average the number of deliveries to participating outlets has been reduced by 76%, exceeding the target of 70% set at the start of the project.

The survey of Bath retailers participating in the consolidation scheme found generally positive attitudes towards the scheme, satisfaction with the service offered, including recycling of packaging, and positive perceptions of the contractor DHL and its staff. Although environmental reasons did not appear to be strong motivators for joining, retailers were supportive of the use of the electric truck. Attitudes towards the fee structure were also positive, as most retailers claimed to have reduced their costs, and gained benefits, by joining the scheme (CIVITAS Renaissance, 2013).

3.3.13. (VDS1) Marking routes for smooth freight and city logistics in Tallinn

Special corridors for freight traffic were developed to guide the freight traffic around and in the city centre to the harbour of Tallinn. These routes were marked with traffic signs, along the corridor and became available to download for GPS navigation systems. 40% of the truck drivers noticed the new signs and the routes were downloaded more than 300 times (Riedel et al, 2013).

3.3.14. (VDS2) Clean Route Planning for Freight Transport in Utrecht

The measure 'clean route planning for freight traffic' focused on defining a method to guide, in real-time, freight traffic along routes that are less congested, based on air quality measurement. A feasibility study was carried out and the design of the navigation system was made. In the development phase a test was carried out with the standard route planner for freight traffic that calculates emissions. The tests should have led to an insight into how the planner performs, and if improvements are possible.

Barriers in the development were the lack of reliable technology to measure the air quality in real time and resistance from citizens living along the routes that were concerned. From the experience in Utrecht, it is recommended to actively involve the citizens and freight transport operators in the earliest stage of the process. A campaign to raise awareness of the air pollution issue on the city level and to present the objective of the measure could contribute to gain acceptance among citizens (Riedel et al, 2013).

3.3.15. (AR1) Freight delivery restrictions in Zagreb

The plan to implement some freight delivery restrictions in the Zagreb city failed. However, the analyses of all aspects of the freight handling provided a clear view of the variations of freight problems (e.g. offences) over the week which is crucial for the further contact with the involved partners. Also, new efforts after the first failure to communicate with the stakeholders were successful showing that it was necessary to build up contacts before asking partners to participate in a platform (Engels et al, 2012).

3.3.16. (AR2) Efficient goods distribution in Aalborg

In Aalborg a low emission zone has been implemented, where only heavy duty vehicles complying with the latest standards (i.e. EURO-4) in terms of environmental performance from engines are allowed to circulate. This approach has proved to have a significant impact in terms of fleet renewal, boosting the replacement of old lorries by newer less pollutant heavy duty vehicles, allowing for a reduction in local emissions (Velazquez Valoria et al, 2013).

3.3.17. (AR3) More flexible access for cleaner freight traffic in Utrecht (Cargohopper)

In 2007, Utrecht introduced a low-emission zone in the city centre. Only freight vehicles with ‘cleaner’ engines can enter this zone. With cameras and license plate registration these restrictions are effectively enforced. This measure already resulted in a decrease in emissions. In cooperation with the transport businesses, Utrecht investigated additional possibilities to improve air quality in the city and implemented the ‘flexible access for cleaner freight traffic’. The measure aimed at reducing PM₁₀ and NO_x emissions from road freight traffic and improving the accessibility of the city centre for cleaner means of transport.

An electric mini-train called Cargohopper was introduced. This Cargohopper is operated by Hoek transport, a transport company which currently manages the existing Urban Distribution Centre. The electric Cargohopper is a multi-trailer, 16-metre long, 1.25-metre wide lorry which has been designed to fit into the small street network of the city centre. Thereby, the Cargohopper has a maximum speed of 25 kilometres per hour and has a capacity equivalent to 5 to 8 vans. The Cargohopper delivers freight from a City Distribution Centre to the inner-city. To conduct the evaluation, several indicators were used to measure these impacts: a decrease of 4 080 freight vehicle trips can be observed during the project, which corresponds to the saving of 88 332 kilometres driven by diesel van or light truck. This in turn resulted in a reduction of 5,8 tonnes of CO₂ emission (-73%), of 0.005 tonnes NO_x emission (-27%) and 0.001 tonnes PM₁₀ emission (-56%).

Regarding the implementation strategy of the Cargohopper, it is recommended to work in collaboration with a well implemented transport provider which allows the Cargohopper to be integrated into the existing transport system: the existing vehicles can be replaced by the Cargohopper, customer demand remains constant and existing Urban Distribution Centres can be further used (see also Quak, 2012 & Riedel et al, 2013).



Fig. 3. The Cargohopper (cargohopper.nl, 2013)

3.3.18. (AR4) City freight delivery plan Bologna

The measure focused on the establishment of the ‘van sharing’ project which consisted of implementing a common logistic platform in the inner city with the aim to optimise and reduce freight traffic. Freight operators did not see the benefits of the common logistic platform and were afraid of losing their market share and turnover (civitas.eu, 2012).

3.3.19. (AR5) Freight distribution in Brescia.

A Logistical Urban Plan has been developed in Brescia to define locations for loading/unloading areas in the historical centre. To study the feasibility of an Urban Freight Distribution Centre and to introduce restrictive measures for freight vehicles.

4. Results

The direct outcomes of the majority of the urban freight logistics measures in CIVITAS have not yet lead to a breakthrough in finding the solution for reducing all problems associated with city logistics. For most cities joining the program, it is the first contact with sustainable urban mobility measures. The mind shift in cities caused by participating in such a European program with contacts with others, might influence the policy in these cities for many years. These cities profile themselves as an expert city in sustainable mobility in their country. An example is the city of Malmo in Sweden that saw the effects within the cluster mobility management and implemented a number of measures in that area after their time as a demonstration city within CIVITAS. Also they have funded research at a Swedish university on sustainable mobility since that time.

Compared to the other thematic clusters of CIVITAS, the urban freight logistics clusters have not reached the results that were hoped for. A large part of the measures in this cluster were not continued after the project or not completely implemented at all during the project. The main reason for that is that for freight transport the participation of private companies is needed because these measures take place in a competitive market. Measures in other clusters mainly focus on areas that are easier to control and to influence directly the city administrators (closer to their daily activities), such as passenger transport (traffic management), public transport and infrastructural developments.

Most of the urban freight measures within CIVITAS are initiated by local authorities and also developed by local authorities without involvement of private parties. In the CIVITAS Plus, measures described in the previous section one could see that in the majority of the urban freight logistic measures the stakeholders (local businesses and transporting companies) should be involved as soon as possible. The measures have good intentions but they lack the support of private companies that need to use the measures to let them be successful. Many of these measures need private cooperation, but they often make logistics operations less efficient and increase the overall logistics costs (see also Rooijen & Quak, 2010).

Awareness of the problems encountered during the implementation of these measures should enable future similar measures to avoid similar problems, and make more effective progress. Therefore recommendations have been written on how to set up urban freight logistic measures by local authorities.

5. Recommendations

Recommendations have been formulated based on the experiences within CIVITAS. These show that several elements need to be in place in order to maximise the likelihood of successful implementation. These recommendations will be described below (based on BOKU, 2010):

Setting up a long-term coordination with the different stakeholders is very important, especially with local businesses like shop owners and local freight deliverers. Their participation and adherence to the new measure will foster a successful implementation. Also local administrations, such as the city councils or the transport/environmental departments (within local administrators), are important as they usually initiate measures dealing with urban freight logistics.

Major changes, such as the start of an integrated urban freight distribution centre are more difficult to implement if there is not already a history of cooperation and trust. The attempts to get the urban freight logistics measures implemented showed that the private sector actors did not automatically share the same urban sustainability issues or objectives of the cities. Since the measures started from a sustainability objective of a city, there was often a mismatch between private and public interests here.

Acceptance of the urban freight logistic measures by the local businesses and carriers is a crucial point. Organising meetings to define the regulations together with the stakeholders through a cooperative process is essential in order to ensure acceptance among carriers and local businesses. Carriers are often afraid of losing the direct contact with their customers when they do not have to deliver to them as well as to loose turnover. As a result they might oppose against measures. The cooperation with producers of goods as well as shop-owners will increase the demand for collective freight deliveries and encourage the carriers to cooperate. Information campaigns and education activities have to be implemented for the stakeholders when introducing technical and

IT-based concepts. It is also important to inform the public and customers about the present problems due to city logistics and the expected costs and benefits of initiatives that are taken to overcome these problems. This can create a balanced view between the public and carriers on the application of innovative and clean logistics tools, hopefully encouraging carriers to join a distribution centre.

The outcomes show that in the beginning, new logistics measures need to be funded by external sources, mainly coming from subsidies from the authorities on different levels. This will only be available if the long-run financial viability and legal feasibility is proven in a substantiated business plan. A new logistics scheme can be set up by the local government but it is advisable that the actual management of the scheme should be conducted by a private transport operator.

Once the scheme has been established, the logistics concept implemented should finally become self-financing after a certain period. If the costs for a logistics solution (investment, operation) are too high, a consideration could be to first start with solutions, which are easy to implement (for example fewer users and less advanced technical tools). Support from public funding in the beginning of a measure's implementation reduces the economic risk of private stakeholders making them more open to cooperation.

Most of the measures can be implemented within the given legal framework conditions by using different legal premises such as ordinary traffic regulations concerning parking and loading/unloading as well as specific transport regulations such as weight limits on specific routes. However, in the case of fundamental changes like the use of environmental zones within a city, new traffic regulation orders may be needed which should be based on the limit values on air quality set by the European directives.

The implementation of urban freight logistic measures often requires many administrative authorisations, which will take more time at different governmental departments than in a commercial business environment. The slow speed of some bureaucratic practices can mean that some situations are hard to keep the cooperation with private stakeholders at the same level as desired. Therefore, communication and cooperation with all partners and authorities is essential. For all kinds of measures dealing with urban freight logistics, a strong stakeholder commitment is essential for successfully implementing measures.

6. Comparison with other thematic clusters

CIVITAS has succeeded in raising awareness for sustainable urban mobility in Europe. Many measures have been implemented successfully (examples can be found on the CIVITAS website: civitas.eu) and are copied by other cities that were not a part of the demonstration projects. Measures in the cluster urban freight logistics were unfortunately less successful than other clusters. The main difference with other clusters is the necessity of partnerships with private sector actors to actually implement an urban logistics measure. This contrasts to other urban mobility measures in other thematic categories that can be taken and implemented by cities themselves. Among the more successful measures are a large number of cycling measures (schemes and infrastructure) and mobility management measures.

7. Conclusion

The direct outcome of the majority of the urban freight logistics measures in CIVITAS have not yet lead to a breakthrough in finding the solution for reducing all the issues associated with city logistics. For most cities joining, the CIVITAS program is the first contact with measures that can increase sustainable urban mobility. The participation in this program often influences the policy in these cities for many years in the direction of sustainability.

Unfortunately, the share of measures that are not (fully) implemented or which activities are terminated after the participation in the CIVITAS program is higher than in other CIVITAS clusters.

Lessons have been learned on what key elements are needed when setting up urban freight logistic measures in order to reduce the risk of failures in future. These key elements are:

- Urban freight logistics can be influenced by building a strong partnership between the involved stakeholders in this sector and/or by creating legal frameworks and regulations.
- Organising meetings to define the regulations together with the stakeholders through a cooperative process is essential in order to ensure acceptance among carriers and other stakeholders. A long period of coordination, cooperation and negotiating has to be scheduled therefore.
- Because of the high competitiveness in the sector it is often necessary that the public authorities provide initial funding and assistance to potential participants of freight schemes. However financial planning should demonstrate financial viability within a reasonable timeframe.

It is advisable that the European Commission and other subsidy suppliers perform checks if these prerequisites are fulfilled before granting future initiatives for urban freight logistics measures.

Acknowledgement

CIVITAS is a European initiative containing different research collaborative projects and coordinated support actions co-funded by the European Commission under the 5th, 6th and 7th Framework Programme, Theme 7, Sustainable Surface Transport. The initiative started in 2002.

References

- BOKU (2010). Policy advices notes on logistics and freight distribution, CIVITAS GUARD.
- CIVITAS Meteor (2006). CIVITAS 1 Cross Site Evaluation; Deliverable 6.
- CIVITAS Renaissance (2013). Working paper Urban Freight Logistics, new concepts for freight distribution, Bath.
- Engels, D. et al. (2012). CIVITAS ELAN Final Evaluation Report D10.11, CIVITAS ELAN.
- European Commission (2011a). IMPACT ASSESSMENT: Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, Brussels, Belgium (Commission Staff Working paper).
- European Commission (2011b). WHITE PAPER Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, COM/2011/0144 final, Brussels, Belgium.
- Lindt, M. van de & S. Emmert (2013). Multi-level process evaluation within CIVITAS PLUS (to be published), TNO.
- McDonald, M. et al. (2010). Cluster Report 4: Logistics and Goods Distribution. Deliverable 2.2, TRG/BOKU, CIVITAS GUARD.
- Quak, H. J. (2012). Improving urban freight transport sustainability by carriers. *Procedia – Social and Behavioral Sciences*, 39, 158-171.
- Riedel, V. et al. (2013). MIMOSA Final evaluation report part A, CIVITAS MIMOSA.
- Rooijen, T. van & Quak, H. J. (2010). Local impacts of a new urban consolidation center- the case of Binnenstadservice. *Procedia - Social and Behavioral Sciences*, 2(3),5967-5979.
- Rooijen, T. van et al. (2012). Drie generaties CIVITAS Initiatief; Stand van zaken verduurzaming mobiliteit in Europese steden, Paper Colloquium Vervoersplanologisch Speurwerk, Amsterdam, 22-23 november 2012 (in Dutch).
- Velazquez Valoria, I. et al. (2013). FINAL EVALUATION REPORT D10.3 Evaluation & Analysis, CIVITAS ARCHIMEDES.
- CIVITAS Website (2012). www.civitas.eu.
- Cargohopper Website (2013). www.cargohopper.nl.