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C-LIEGE - *Clean Last mile transport and logistics management for smart and efficient local Governments in Europe*

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1. Introduction

This report is part of the C-LIEGE project, whose main goal is to test urban freight transport soft measures in regard to their ability to reduce urban freight traffic, energy consumption and pollutant emissions as well as freight carrier operating costs. The focus is not on already completed and documented soft measures across Europe, but on measures that are implemented in seven pilot cities that are part of the C-LIEGE consortium. This case study approach was deemed most suitable for ensuring an in-depth analysis of achievable impacts *and* the processes and factors that support or hinder their achievement.

In support of these goals Work Package 6 had to monitor the implementation of C-LIEGE measures in seven pilot cities and assess their current and future impacts. This report concludes the work of WP6 and integrates and summarises its main results.

In particular this Integrated Evaluation Report aims to present both qualitative and quantitative results from both the monitoring and evaluation, arrive at more general conclusions, identify typical conditions, processes and success factors and contribute to transferability guidelines that feed into WP7.

The report is structured as follows: First a brief overview is given of the methodologies used for the evaluation and monitoring. Chapter 2 presents a cross-case analysis that identifies key soft measure approaches to improving urban freight transport. The chapter gives short overviews of implemented soft measures and summarises main results from the impact assessment. Chapter 3 then focuses on successful implementation processes, drawing to a large extent on results from the monitoring component of WP6. Finally, Chapter 4 provides a concise summary of the overall results and develops guidelines for how the C-LIEGE results may possibly be transferred for other purposes or other cities.

1.1. Overview of the evaluation and monitoring methodology

The C-LIEGE project implemented pilot measures in seven cities across Europe. The task of WP6 was to monitor the implementation of the measures and to evaluate their impacts. The impact indicators and targets specified at the inception of the project are

- 10% decrease of CO. CO2, NOx and PM10 emissions generated by freight vehicles in the pilot cities,
- 20% decrease of average daily number of freight vehicles entering the pilot cities,
- Reduction of on average 10,000 kilometres per month travelled by freight vehicles in each pilot city,
- 8% decrease of operating costs for freight carriers active within the pilot urban areas.

In order to assess the impacts of the pilot measures the evaluation first conducted an impact chain analysis as part of the ex-ante evaluation. This served the purpose of better focussing the impact assessment and tailoring it to the specific nature of the soft measures implemented in the C-LIEGE pilot cities. The main idea behind this method was to identify and analyse the causal chain of events (or pathways) all the way from a specific measure or implementation activity via intermediate steps to direct outputs created by the measure up to the indirect outcomes or impacts (see Figure 1).

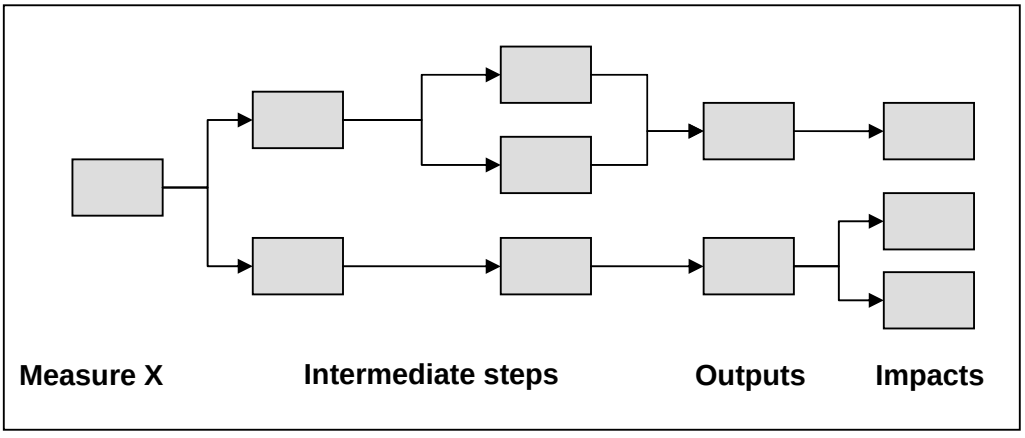

Figure 1: Conceptual diagram of an impact chain

The impact chain analysis helped to assess the causal and empirical strength (or weakness) of influence of a particular C-LIEGE soft measure on the expected urban freight transport impact indicators. The impact chain analysis for each measure was carried out as part of the ex-ante evaluation but its main results were carried over to the final evaluation where they served as the foundation for the subsequent quantitative impact assessment**.**

The main component of the C-LIEGE evaluation methodology was a scenario-based impact assessment. Scenarios are commonly used to explore developments on the premise of certain pre-defined assumptions. In a way a scenario consists of a model of reality and only certain entities or relationships of this model are changed in order to explore their possible impacts on current or future developments. The preceding impact chain analysis and comparison with reference projects served to establish the logical and empirical interrelations between key elements of the model underlying the scenarios developed in the C-LIEGE project. Two main scenarios were distinguished:

- A “do nothing scenario” which assumes that general framework conditions and urban freight transport in the pilot cities do not fundamentally change – in particular that no C-LIEGE soft measures are implemented;
- a “C-LIEGE scenario” assuming that the soft measures selected by the pilot cities are fully implemented and will have an effect upon urban freight transport demand in the pilot cities.

In the final evaluation report of the project (D6.3) several C-LIEGE scenarios were developed and calculated for each measure, namely a scenario a) at a city-wide level for 2013, b) at city-level for the year 2020, c) at local pilot area level for 2013 and d) for the pilot area for the year 2020.

All of these scenarios were evaluated in regard to their impacts on energy consumption, pollutant emissions, number of freight vehicles entering the city and urban freight transport operating costs. The following table lists key urban freight transport indicators that can be used to gauge these impacts.

Impact indicators	*Key urban freight transport indicators*
Energy consumption and pollutant emissions of freight transport in pilot city	Freight kilometres
	Emissions per freight t/km
	Average freight volume per trip
	Fossil fuel consumption in litres
Freight vehicles daily entering pilot city	Freight trips
Urban freight transport operating costs in pilot city	Freight trips
	Freight kilometres
	Freight vehicle/fleet characteristics
	Fuel/energy costs

Table 1: Key UFT indicators for C-LIEGE impact assessment

These key urban freight transport indicators can partly be estimated by using proxy indicators. For example the *number of freight trips* and *freight kilometres* can be estimated by the distances between major urban freight transport origins and destinations, the population density of a city (important for home deliveries), characteristics of the freight transport fleet, average freight volumes per trip and overall freight volumes in a pilot city. The *emissions per freight kilometre* can be estimated by referring to the age and size distribution of the vehicle fleet, freight vehicle emission standards.

The above table reflects the main 'performance indicators' that the C-LIEGE project had to provide information about vis-à-vis the European Commission's Intelligent Energy Europe programme, which funded the project. A brief reflection on these indicators shows that they do not always capture the full positive effects of the C-LIEGE pilot measures. For example, all indicators were only related to freight vehicles. Thus, only pollution savings from freight vehicles could be assessed in the evaluation. But for example when there is no double parking of unloading lorries in the street due to newly created loading bays on the side of the street then there will be less congestion of car traffic as a whole in that street. But the reduced pollution from passenger vehicles (which really make up the main bulk of traffic) are not captured by the C-LIEGE performance indicator and thus did not enter into the assessment. Another issue in this regard concerns pilot measures that aim at easing traffic flow e.g. through continuous traffic monitoring and traffic information to vehicle drivers.

Obviously, if a lorry driver receives information about a traffic jam and decides to circumvent it, then the resulting route will be longer in terms of distance travelled – and also create more fuel costs and pollution. But of course in terms of overall traffic such 'detours' will contribute to a dissolution of traffic jams and have an overall positive effect on car traffic pollution and costs. So by strictly applying the C-LIEGE performance indicators the assessment in this case only captures the negative side effect e.g. of more freight vehicle kilometres travelled. In a similar way this also applies to measures that involve so called freight maps, which seek to influence freight vehicle drivers to use roads that are especially suited for freight traffic - and avoid residential areas and sensitive facilities like e.g. schools or hospitals. Of course the side effect of using these preferred routes is that they are longer than the direct routes – and thus increase fuel consumption and pollution. Again, the C-LIEGE performance indicators only capture the negative side effects – which from a transport policy point of view would have to be weighed against the positive effects of keeping pollutant emissions, noise and traffic dangers away from sensitive population groups and areas. Finally, the indicator regarding freight vehicles daily entering a pilot city turned out to be problematic, because for political and economic reasons the pilot cities found it (in almost all cases) impossible to restrict or reduce freight access to their city as a whole, as this would have severely restricted freight transport and trade. This would have potentially decreased their competitive position vis-à-vis other cities with unrestrained freight access. To be clear, there were pilot measures that restricted access e.g. to particular parts of the city (e.g. the city centre or a particular street), but not to the pilot city as a whole. Thus the indicator 'freight vehicles entering the pilot city' was not attainable for political reasons. The C-LIEGE project responded to this situation by adding an additional performance indicator (formerly not included) that focuses on fossil fuel consumed by freight vehicles. For a programme like the Intelligent Energy Europe programme it was considered fitting to include such an indicator that specifically addresses energy consumption.

Comprehensive urban freight transport model

One of the greatest challenges of the evaluation of C-LIEGE measures was to set each individual impact in the context of overall urban freight transport of a pilot city. Thus, when specific information was available on concrete local improvements due to a C-LIEGE measure, e.g. reduction of pollution in a particular local area of a pilot city, the question remained how significant this impact is from a city-wide perspective. Thus one needs an overarching frame of reference to compare individual impacts to.

Lacking large-scale survey data on urban freight transport in most pilot cities, it was necessary to conduct model-based estimations. For this purpose a simple urban freight transport model was developed which simulates urban freight trips and routes based on a) known origins and destinations of urban freight traffic in a pilot city and b) the road network charac-

teristics in a pilot city. For each pilot city the major freight transport entry points (typically 4-5 major roads/motorways), the major industrial, commercial/services and residential centres were identified (5-7 for each category). See the example for Leicester below. This results in between 200 and 250 distinct freight trip connections for each pilot city. On this basis and using the existing road network the major freight transport links were simulated and their distances calculated as an important input variable for all subsequent quantitative estimations.

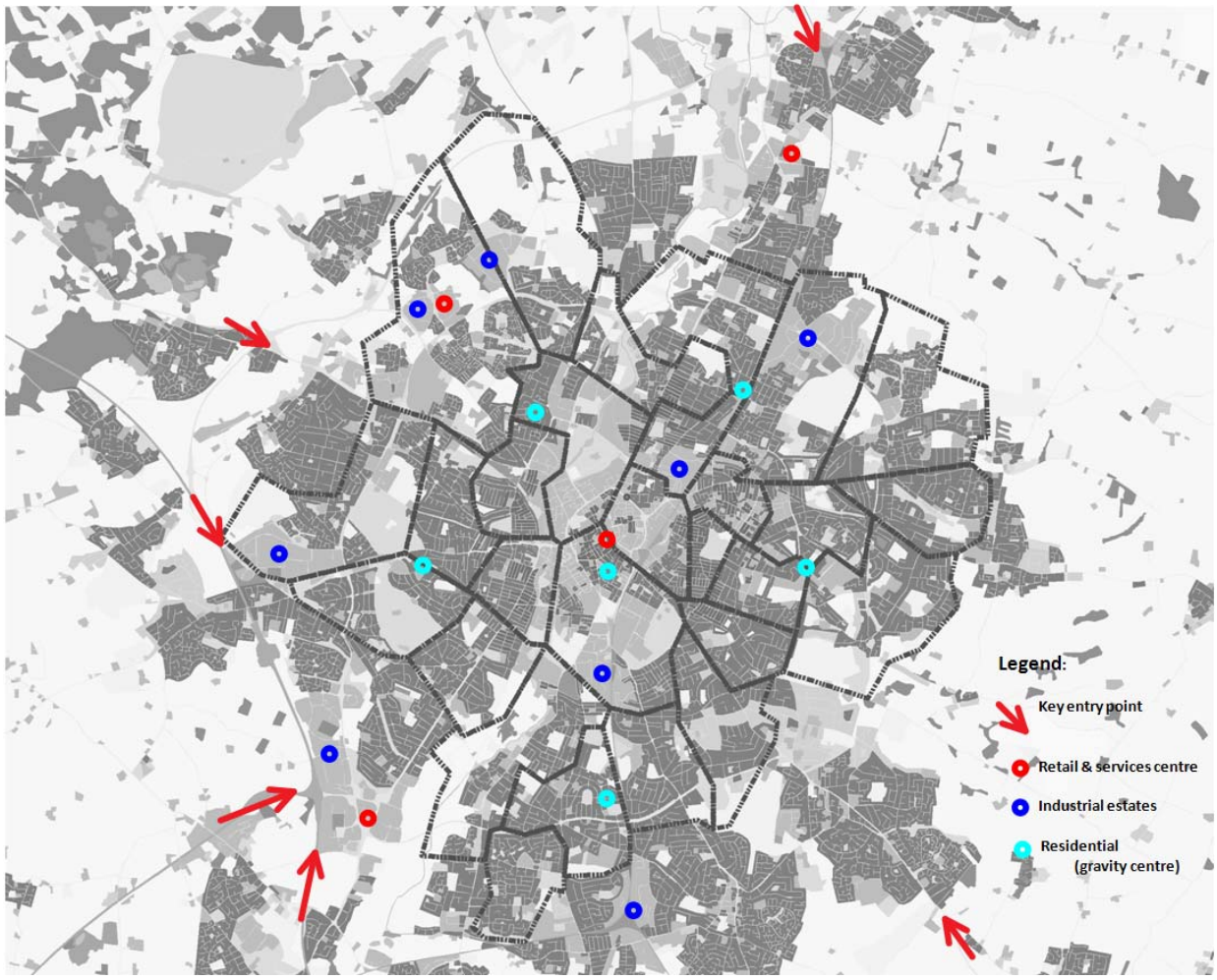

Figure 2: Major freight transport origins and destinations in the pilot city Leicester

Further input indicators were needed and calculated beforehand:

The total number of urban freight transport trips was determined based on existing freight traffic survey data from Szczecin and Montana, and then adjusted for all other pilot cities based on available local statistics.

The shares of the different freight traffic sectors (relating to households, retail and services, manufacturing and construction) were based on a more complex and survey based freight transport model, namely the FRETURB model, which has been developed and continuously upgraded and fine-tuned in several research projects by the Laboratoire d'Economie des Transports since the mid 1990s (see e.g. Routhier, Patier, Aubert 1996; Bonnafous, Gonzalez-Feliu, Routhier 2013). Household oriented freight trips were added to this originally only establishment oriented model in consultation with several model developers. These shares were held constant across pilot cities except when absolutely necessary to reflect significant deviations in the structure of the local freight traffic (e.g. a very large industrial estate bordering Hal Tarxien – almost half the size of the municipality - which creates the majority of traffic there).

It was also necessary to determine the specific emission characteristics of the vehicle fleet that operates in each pilot city. The emission coefficients were calculated on the basis of a comprehensive EU assessment of air pollution from freight transport (EEA 2013) and European emission standards for the different EURO emission classes. Linking these emission values with the specific breakdown of the freight vehicle stock (number of vehicles in each emission class or age class) in each C-LIEGE country yielded specific emission coefficients for each C-LIEGE country or city. Thus all impact assessments reflected the fact the vehicle fleets in the various C-LIEGE pilot cities are not the same and what difference this made for the emission of pollutants.

The composition of operating costs was determined based on the very detailed annual survey of freight operators conducted by the UK Road Hauling Association (RHA 2013). Their figures were adjusted for each participating country based on Eurostat freight business data (particularly staff costs in the freight sector) and average fuel prices for diesel in each country (October 2013 values).

Equipped with these fundamental input indicators all subsequent calculations could be performed, which are presented and discussed in detail in the Final Evaluation report (D6.3).

By virtue of this methodology's key feature, namely that all impacts are by design right away calculated within the context of the totality of urban freight traffic in a pilot city, it was possible to easily compile a cumulative impact assessment that adds up the individual impacts from all measures implemented in a particular pilot city.

Monitoring methodology

The overall design of the C-LIEGE monitoring consisted of three interrelated components (see Figure 3) namely institutional process mapping, progress monitoring and more conventional input/output/impact monitoring. The first two components were developed in recognition of the fact that many C-LIEGE measures would in the pilot phase consist mainly of planning and decision-making processes, which do not lend themselves to classic input, output and impact monitoring. Thus greater emphasis was placed on monitoring in detail how the planning and decision-making processes evolved in the pilot cities. Ultimately, all data collected was analyzed to evaluate the impacts that the measures had on the pilot cities.

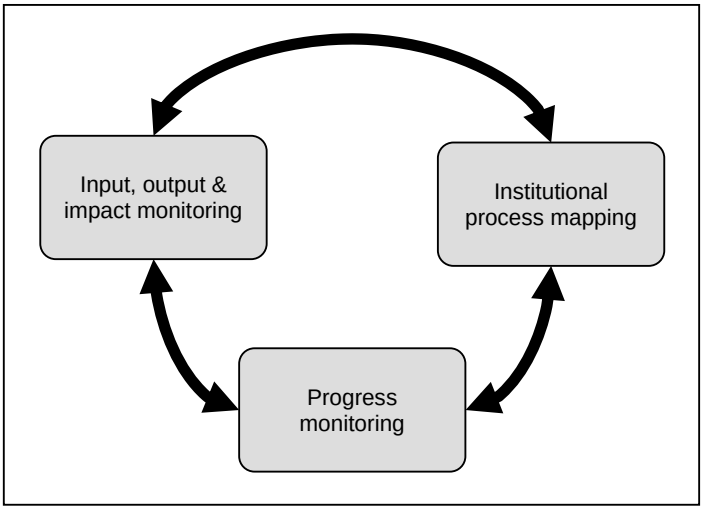

Figure 3: Main components of the C-LIEGE monitoring system

In addition to the monitoring of inputs, outputs and impacts the second component of the monitoring system focused on processes. Using a simple scorecard methodology the pilot city partners were asked to assess the progress of their pilots and each measure (separately) in regard to the following critical implementation processes:

1. Goal setting and work planning
2. Preparatory data analysis and risk assessment
3. Financial planning and sourcing
4. Institutional/personnel planning
5. Monitoring and evaluation
6. Stakeholder involvement and public information sharing
7. Political decision-making

8. Technical implementation
9. Institutional implementation
10. Exchange with partner cities
11. Implementation planning beyond the pilot phase (measure consolidation)

The C-LIEGE pilot cities were asked to assess the presence of potential challenges throughout the duration of the project. This was done to help the pilot cities to identify problems before they escalated and disrupted the progress of their efforts

In order to conduct the monitoring each C-LIEGE pilot city had to complete a separate form for each of the measures implemented. In total, three monitoring cycles were conducted resulting in three monitoring reports (initial, interim and final). The contents of these reports included (for each measure) a log of activities, the timeline of implementation, a SWOT analysis, the progress monitoring, feedback and lessons learned from stakeholders. The pilot city partners were responsible for filling in and submitting the monitoring forms/reports for each of the measures implemented in their respective pilot city. C-LIEGE partner IMPERIAL collected the individual forms, analysed and consolidated them at the C-LIEGE project level.

2. Effective approaches for more efficient urban freight transport

This chapter presents key findings from the impact assessment that is documented in considerably more detail in the Final Evaluation Report (D6.3). That reported focused on each individual C-LIEGE measure and then added up the impacts at the pilot city level.

In the following sections the impacts are not analysed individually or along the pilot cities in which they were implemented. Instead the measures are analysed across all cities and grouped in four main approaches, namely a) routing and guiding urban freight traffic, b) managing the loading and unloading of urban freight, c) aiding the transformation of the urban freight fleet and its operation, and d) connecting, coordinating and planning with freight stakeholders.

2.1. Routing and guiding urban freight traffic

2.1.1. Overview

The first general approach of soft urban freight transport measures focuses on routing and guiding urban freight traffic – but not through physical improvements like better or new roads. Instead most soft measures following the routing and guiding approach leave the vehicle drivers their free choice in finding the most efficient route to their destination. It is mostly through providing particularly relevant traffic information or other incentives that these measures seek to influence drivers' behaviour – both ad hoc and in the long term.

In order to better understand the subsequent analysis of measures they are briefly introduced at the beginning. The following measures implemented and tested within the C-LIEGE project can be categorised as being 'routing and guiding' soft measures:

- *Freight map (implemented in various variations in Newcastle, Leicester, Montana)*

  The freight map measure in Leicester built on an existing freight map and was primarily concerned with creating and distributing a downloadable application for mobile phones that would guide freight drivers to their destinations in Leicester along the most suitable route. The application is based on the official ordnance map and allows drivers to enter their vehicles' details and destination. The programme then identifies the best route, i.e. which avoids sensitive areas, congested roads, lay byes, rest pints etc. The application was made downloadable from the webpage of the Leicester Freight Quality in order to be installed on any mobile phone.

The freight map measure in Newcastle aimed to provide valuable freight transport information to operators and lorry drivers in the Tyne and Wear region in the form of an online freight map. This map tool is available on the internet and can be used for finding the most suitable route for freight transport to a particular destination in the region – while at the same time allowing to identify possible size or weight restrictions (e.g. due to bridges). In addition, the map gives very detailed maps that can be downloaded and printed for major freight traffic destinations, i.e. showing the very specific location of particular companies e.g. in a shopping centre or industrial estate.

The freight map measure in Montana is a real paper map printed on the back of the permission cards which every freight vehicle driver gets when paying the permission fees for accessing the city centre of Montana. The map identifies restrictions and obstacles for freight vehicle drivers and shows a preferred route that drivers are advised to take to circumvent the city centre and residential areas. In addition to the already existing map, Montana plans to provide online cartography versions as well.

- *Sign posting to industrial estates (Leicester)*

  This measure aimed at improving freight transport access to two industrial estate in Leicester. Lorries can only access the Faircharm Industrial Estate through one particular road, which is often missed by lorry drivers. Bursom Industrial Estate is also not easily found and one access road is not suitable for heavy goods vehicles. Therefore signs are being installed that guide the lorry drivers to the right access roads of these two industrial estates.

- *Ad-hoc routes, traffic monitoring and announcements (Newcastle, Stuttgart)*

  In Newcastle a traffic monitoring and traffic control centre was set up with the aim of improving traffic management in Newcastle and the Tyne and Wear region. One of its key activities is to continuously monitor traffic in the region by use of around 100 CCTV cameras that partly also utilise license plate recognition software, thus allowing to determine travel speeds and congestion occurrence. The results of the ongoing traffic monitoring are then broadcast through the social media outlet Twitter (3,500 followers so far) and local radio stations (including the local BBC station).

  A similar measure is being implemented in Stuttgart and aims at improving freight traffic flow in the city of Stuttgart by providing daily and ad-hoc traffic information and recommendations specifically geared to lorry drivers. This measure thus tries to provide some solutions for the specific traffic problems in Stuttgart, which is located in a narrow valley and is therefore prone to traffic jams and other traffic disruptions. In such conditions large lorries need to avoid narrow detours as otherwise they may get stuck and be the cause of new congestions. Furthermore, when large events take place in Stuttgart the arrival and departure of freight vehicles servicing an event need to be coordinated in a way that avoids traffic problems. Daily and ad-hoc traffic

information and routing recommendations will be disseminated through the internet and possibly social media (e.g. Twitter) to lorry drivers in the Stuttgart region.

- *Intelligent Transport System (ITS) for bridge traffic (Szczecin)*

  This measure aimed at increasing the traffic flow on Szczecin's to main downtown bridges, which are chronically congested during peak hours. Starting in November 2012 a traffic monitoring system and large displays on the access roads to the bridges were installed. Now drivers on either side of the bridges are informed, as they approach the bridges, which bridge currently has the least traffic. In addition a smart phone application was developed and tested which enables users to access information to the ITS system so that they can know the traffic condition on the bridges in advance.

- *Optimal location of lorry refuelling station (Stuttgart)*

  This measure was developed during the pilot phase of C-LIEGE and brought together the two suburban municipalities in the Stuttgart region. The latter comprises several logistics companies whose freight vehicles often take an (illegal) shortcut through a residential area in order to get to the next lorry petrol station. Otherwise they have to drive a long detour to get to the petrol station. Through talks between the two municipalities a new idea emerged to locate a new lorry refuelling station on a currently unused tract of land in a central location. The new location is ideally suited for freight companies and will make any detours and illegal shortcuts unnecessary.

- *Re-routing of transit traffic (Tarxien)*

  This measure aims at reducing the negative impacts of freight traffic that currently goes through the busiest inner city street of Tarxien. By closing off this street for freight through traffic the congestion, noise, pollutant emissions, fossil fuel and energy consumption are reduced. Instead the freight traffic now follows a major road that goes around the city of Tarxien.

2.1.2. Strategies

When analysing the above measures in regard to their 'conceptual core' and main strategy it becomes clear that the 'routing and guidance' soft measures actually consist of four strategic types.

The first type or strategy consists of creating restrictions for freight traffic so that vehicle drivers cannot use a particular street or access a particular area within the city. This is a quite traditional strategy that has been used by municipalities for a long time. In C-LIEGE it is employed in the case of Tarxien's freight traffic re-routing or – in a way – also in the limited traffic zones in Emilia Romagna or Montana which also restrict/permit vehicular access for certain kinds of vehicles and in certain time windows respectively. This type of measure is mostly used in order to ease traffic problems in particular part and/or 'protect' particularly sensitive population groups or facilities, like e.g. schools, hospitals or day care centres. Therefore the measure typically starts from a particular and geographically based problem and then utilises appropriate traffic control tools to solve or ameliorate this problem. While quite effective from the point of view of the protected group or area, the measure is often perceived as quite drastic by vehicle drivers. And most often the traffic problems like congestion, noise and pollution are only shifted to other areas. (Note that in the case of Emilia-Romagna the measures were on the other hand also intended to ease the fleet renewal towards more energy and environment efficient vehicles – see 2.3 further below).

The second type or strategy consists of providing 'static' information about permanent obstacles, restrictions but also options and recommendations. In C-LIEGE this strategy was used by the various freight maps and the signposting to industrial estates measure. Sometimes these measures also aim to keep problematic freight traffic away from sensitive facilities or population groups. In a way this is also behind the 'preferred routes' that are identified and recommended in freight maps. But this strategy also works from the other direction, i.e. warns freight vehicle drivers of obstacles like low bridges, narrow roads or other restrictions. And lastly, some of these measures also help vehicle drivers find a better suited route or the best access to certain destination. Newcastle's 'site plans' of major industrial estates or retail centres is a case in point. They show exactly where companies are located so that lorry drivers do not spend additional time (and fuel) on the very last stretch of their journey.

The third type of strategy consists of providing real time information on current traffic conditions, in particular congestion or unforeseen obstacles. The traffic monitoring centre in Newcastle, the ad-hoc routing service in the Stuttgart region and the ITS bridge measure in Szczecin are C-LIEGE measures that employ this strategy. At the core this strategy requires continuous monitoring of traffic flows – whether for only a particular road stretch or the entire road network. Analysing this data flow requires appropriate technology and/or competent staff that make sense of the data and identify problems to be announced to vehicle drivers.

Thus this measure also needs effective communication channels to get the information to the drivers. Typically *all* vehicle drivers in a city are 'targeted' by this strategy.

The fourth type or strategy of soft measures is about creating incentives to use (or not use) certain streets. Such incentives can come in different forms. For example the new, more centrally located lorry refuelling station provides incentives to vehicle drivers primarily in the form of saved time. In this way drivers are 'lured away' from traveling down a particular road or illegal short cut to the already existing refuelling station in the adjacent municipality. The 'lorry expressways' in Leicester offer freight operators – under certain conditions like using low emission vehicles – the benefit of using the bus lanes on the city's arterial roads. Again the major incentive for drivers is less time spent in heavy traffic – or lower fuel consumption from the point of the view of the fleet operators.

2.1.3. Impacts

Based on the above categorisation this section aims to compare and analyse the traffic, environmental and economic impacts of the routing and guiding soft measures. Detailed information about the specific impacts of particular measures were analysed (and can be looked up) in the Final Evaluation Report (D6.3) of the C-LIEGE project. The focus in this section is on identifying general patterns, similarities and differences.

2013 soft measure impacts (city level)

		Performance indicators			
		Vehicle kilometres	**Pollutant emissions**	**Fossil fuel consumption**	**Freight operating costs**
C-LIEGE targets		***-10,000 km***	***-10.0%***		***-8.0%***
Stuttgart region	Lorry petrol station	- 14,586 km	-10.3%	-10.2%	-6.1%
Leicester	LEZ lorry expressways	0 km	-14.7%	-10.0%	-6.2%
Szczecin	ITS bridge traffic	0	-4.0%	-4.0%	-2.0%
Newcastle	UTMC traffic information	+ 4,661 km	-4.2%	-4.2%	-2.4%
Stuttgart region	Ad-hoc routes	+ 6,845 km	-2.7%	-2.7%	-1.3%
Tarxien	Re-routing of freight traffic	+ 3,941 km	18.5%	19.2%	13.1%
Montana	Freight map	+ 2,055 km	1.3%	1.3%	1.0%
Newcastle	Freight map	-72,102 km	-4.5%	-4.5%	-2.8%
Leicester	Freight map	-4,522 km	-0.2%	-0.2%	-0.1%
Leicester	Signage to industrial estates	-8,174 km	-0.4%	-0.4%	-0.2%

Table 2: Impacts of 'routing and guidance' soft measures

The summary table above presents one level of results from the C-LIEGE evaluation, namely impacts of C-LIEGE soft measures at the city level in the year 2013. While impacts were also analysed for the year 2020 and at the local, pilot area level, the above table is best able give a comprehensive yet 'differentiating' overall picture of the measures. A simple colour code was used to highlight in green those impacts that produce relatively high impacts and in orange those measures that produce 'negative' impacts vis-à-vis the C-LIEGE indicators, i.e. increases instead of decreases of traffic, environmental or economic costs.

The routing and guiding measures were ordered into the four main strategies outlined in the last section. The first group of measures comprises the 'guidance through incentives' strategy. Both measures in this group show high reductions of pollution, fuel consumption and freight operating costs. While the incentives offered are quite different, it is obvious that in both cases the benefits from the measure are direct and tangible to the individual freight vehicle driver, which probably leads to a good reception or take-up of this measure. Nevertheless, the reduction impacts are generated in completely different ways: In the case of the lorry petrol station they stem from the reduced vehicle kilometres and resulting savings in fuel, pollution and operating costs. In Leicester the vehicle kilometres remain the same, but a prerequisite for using the 'lorry expressways' is to drive a low emission freight vehicle. Thus the incentive of being able to use the speedier bus lanes on the arterial roads ultimately aims to bring about changes within the freight vehicle fleet.

The second group of measures shown in the table comprise the 'real time traffic information' strategy. Two of the three C-LIEGE measures in this category show relatively high impacts for pollutant emissions and fossil fuel consumption. The success of these measures probably also comes from (as in the group above) the immediate benefits that vehicle drivers derive from these information services. The main difference is the spatial coverage of the two measures: The ITS system monitors and controls traffic on two downtown bridges in Szczecin, whereas the traffic control centre in Newcastle serves the entire metropolitan area around Newcastle. Focusing on the 'negative' impacts in this group highlights an important side effect: In principle these traffic information services tend to lead to longer trip distances when drivers take a detour to avoid congestion or other traffic obstacle. This may soon also apply to the ITS system in Szczecin when the currently alpha tested smart phone app is used widely and drivers get information about high congestion on both bridges and then decide to take a longer detour avoiding the bridges altogether. However, the overall ecological and financial balance may still be positive as standing in a traffic jam also comes with increased fuel consumption, pollution, driving time and operation costs.

The third group of measures is only exemplified by one C-LIEGE measure in the table. The re-routing of freight traffic in Tarxien (Malta) follows the 'blocking off freight traffic' strategy.

This fairly conventional traffic intervention is estimated to lead to 'negative' impacts across the board of impact indicators: high relative increases of vehicle kilometres, pollution, fuel consumption and operating costs. These stem from the detour that freight drivers have to take after the more direct route was closed off for heavy goods vehicles. This points to the same dichotomy as already detected above: On the one hand side the detour and resulting environmental and economic costs are negative impacts. On the other hand the detrimental side effects of freight traffic are channelled away from sensitive or vulnerable groups or facilities. In the end, it is a trade-off decision that has to be carefully. In the traditional 'static' measures of this group this is clearly possible – whereas the thousands of individual drivers that react to traffic jam warnings may simply prioritize driving time over all possible alternative concerns, including environmental costs.

The fourth group of measures presented at the bottom of the table stand for the 'static traffic information' strategy. The group primarily consists of variants of freight maps that were developed by public agencies and then made available to vehicle drivers in different forms (paper version, available online, usable on a mobile phone). It seems that the most rudimentary form that only shows a few obstacle/restrictions and otherwise banks on freight vehicle drivers to follow certain 'preferred routes' is the least effective and may even create 'negative' impacts of the type just discussed, because the preferred routes are longer yet certainly advantageous from a variety of aspects. The most useful and thus effective measure of the three freight maps is the one offered in Newcastle. While it contains a conventional navigation functionality (like the smart phone application in Leicester) that also warns of static freight transport restrictions, the key to its success are the detailed site maps of industrial estates and retail centres. These are of high value to vehicle drivers and reduce all impact types because drivers cut down on or completely eliminate the often time-consuming 'driving around' on the very last stretch of their journey when they cannot find the exact location or access points for industrial and retail companies. Lastly, the sign posting to two difficult to access industrial estates in Leicester had a surprisingly high impact on absolute vehicle kilometres travelled, which of course create only small environmental and economic impacts when considered in the context of all freight traffic in a city like Leicester. When looking at a lower spatial level – like just around the two industrial estates, the relative impacts are of course more pronounced. This is of course true for almost all measures with a clear territorial basis.

2.2. Managing the loading and unloading of urban freight

2.2.1. Overview

The second general approach of soft urban freight transport measures focuses on the very last phase of a freight delivery: the last metres so to speak and the loading or unloading of freight. A variety of measures are geared towards regulating, managing or supporting the (un)loading related activities. Typically these measures relate to goods delivery in the centre of a city where freight loading activities are in direct 'competition' with other traffic members in regard to road and parking space.

The following measures implemented and tested within the C-LIEGE project can be categorised as loading/unloading related soft measures:

- *Providing (un)loading slots (Szczecin, Tarxien)*

  In Szczecin this measure aimed at reducing traffic congestion on busy city streets. This congestion is often created by freight vehicles parking directly in the street when they load or unload goods for shops or make home deliveries. By designating special parking bays for freight vehicles the traffic was able to flow again and thus avoid the extra energy and fuel consumption, pollution, time and costs that traffic jams typically create.

  In Tarxien this measure was taken up for the same reasons as in Szczecin, namely congestion problems in its main inner city shopping street due to double parking of freight vehicles. The Maltese transport authority rejected an initial proposal for loading bays on the side of the street on grounds that the road was too narrow and could not even accommodate parking of freight vehicles in loading bays. Therefore new locations for loading bays were identified in one of the side streets that branches off in a central part of the main street. Thus, if this measure is accepted by Transport Malta, all loading and unloading actions can be performed there and goods are then transported to the respective shops.

- *Loading fees and time window restrictions (Montana)*

  This soft measure introduced differentiated fees for loading and unloading in the city centre of Montana. Fees differ according to vehicle size and emission characteristics as well as time of day when the loading is taking place. The measure thus combines two interrelated soft measures, namely time-based access restrictions to the city centre and related loading permission fees. The 'driving force' in Montana's case is the new combined charging scheme introduced during the C-LIEGE implementation phase.

- *Pack stations (Szczecin)*

  This measure aimed at improving the utilization of packstations by relocating underperforming existing pack stations (e.g. by moving them to the most important transport nodes like bus or tram stops as well as to the locations closed to big stores – hypermarkets and shopping centres) as well as setting up additional packstations. This makes the use of pack stations more attractive to households and thus eliminate freight trips for parcel couriers that at the moment deliver most parcels to individual addresses.

- *Low emission zone (Leicester)*

  This measure aimed to establish a low emission zone in the city centre and possibly along arterial roads to reduce carbon emissions, ease congestion and improve quality of life. This measure was to include access restrictions for certain types of freight vehicles and/or certain times. Because of the political nature of such restrictions, the municipality later decided to take a cautious approach and not rush any restrictive policies and risk the opposition of retailers and freight operators. Most likely the city of Leicester will not impose mandatory access restrictions but rather use incentives for freight operators to use cleaner vehicles for accessing the city centre. This would be achieved, for example, by giving operators who service the city centre with cleaner vehicles priority in using loading bays but also to let them use the bus lanes of the major arterial roads leading into and out of the city centre.

- *Limited traffic zone (Piacenza)*

  This measure aimed to harmonize freight transport restrictions/permissions across all the main municipalities of Emilia–Romagna. The measures are addressed to freight vehicles under 3.5 tons and concern time windows, access restrictions / permissions, as well as the potential simplification for obtaining access permissions to Limited Traffic Zones (LTZ), as a further topic for the project's follow up. The overall aim is to promote energy-efficient urban freight traffic, greater use of cleaner and energy saving vehicles for goods deliveries, a shift towards the use of the energy saving vehicles at unvaried road freight volumes. That is also consistent with the fact that administrative measures in city logistics usually do not impact on the quantity of goods transported (unless there is a complete ban of entering a specific zone of the city) but influence the types of vehicles entering the city.[1]

[1] Note that the results reported by ITL on the pilot on harmonization of city logistics rules in Emilia-Romagna represent the technical contributions of the C-LIEGE partner ITL within the C-LIEGE and are not to be considered the official evaluation made by the Regional Government of Emilia-Romagna. Notwithstanding the full involvement of the Region in the project activities, the evaluation work was carried out at the technical level without an institutional endorsement of the Region of the evaluation itself, which was not required in the project.

2.2.2. Strategies

When analysing the above measures in regard to their 'conceptual core' and main strategy it becomes clear that the loading and unloading related soft measures consist of three strategic types.

The first type or strategy consists of regulating access and (un)loading conditions in particular parts of a city. Typically a specific geographic zone is designated e.g. as Limited Traffic Zone and closed e.g. for heavy goods vehicles. A softer approach tries to regulate primarily by differentiated access permission or loading fees. There are many different systems of such fees, as demonstrated in the C-LIEGE measures of this type. Access and loading regulations mostly also have a time component in that they only allow loading and unloading activities during certain time windows. While most of the measures in this group make use of ordinances and can thus be enforce (e.g. by traffic police), the example in Leicester shows that an incentive-based system is also possible (even though it is not clear yet if it will really be feasible and effective). In Emilia-Romagna and Montana differentiated permission fees are used as indirect incentives.

The second strategy consists of providing loading and unloading aids to freight vehicle drivers. Such support mostly comes in the form of loading bays, i.e. designated parking spaces that are reserved for freight vehicles loading or unloading goods. This gets the freight vehicles off the street (where they often used to double park and thus create traffic jams). Or it avoids additional parking search traffic when lorry drivers circulate in the streets in search for a suitable place to park their vehicle. While measures in this group are usually appreciated by freight vehicle drivers (in case the parking bays are located in the right spaces), the lost parking space for passenger vehicles sometimes raises opposition from residents or shoppers.

The third strategy consists of concentrating deliveries in central locations instead of delivering the goods to many individual addresses. Pack stations are the best example for this type of measure. Freight operators can combine many parcels and only deliver them to a few pack stations where customers can pick up their parcels any time they want. The strategy is thus to consolidate freight trips and in this way save vehicle kilometres, driving time and consequently fuel, emissions and operating costs.

2.2.3.Impacts

This section again seeks to find general patterns, commonalities and differences between the soft measures discussed above – in particular in regard to their transport, environmental and economic impacts. The soft measures that manage the loading and unloading of freight were ordered into the three main strategies outlined in the last section.

2013 Soft measure impacts (city level)		**Performance indicators**			
		Vehicle kilometres	**Pollutant emissions**	**Fossil fuel consumption**	**Freight operating costs**
	C-LIEGE targets	***-10,000 km***	***-10.0%***		***-8.0%***
Montana	Differentiated loading fees	- 21,194 km	-13.3%	-13.3%	-8.6%
Leicester	Environmental zone	0 km	-14.7%	-10.0%	-6.2%
Piacenza	LTZ harmonization	0 km	-3.5%	-2.5%	-1.1%
Tarxien	Loading bays	- 9,890 km	-29.1%	-29.7%	-22.2%
Szczecin	Loading bays	- 23,859 km	-0.4%	-0.4%	-0.4%
Szczecin	Pack stations	- 11,374 km	-0.13%	-0.14%	-0.11%

Table 3: Impacts of 'managing loading and unloading' soft measures

The first group of measures comprises the 'regulating access and loading conditions' strategy. As can be seen in the table the measures in this group were evaluated to achieve high impacts on most impact indicators. This might have to do with the fact that the city centres, in which the limited access zones are located attract a significant share of all urban freight traffic in a city. Thus any measure that regulates this sector of transport can potentially create large effects. However, in their current form (or the aspects that were evaluated) these measures differ quite a bit. Only the measure in Montana was evaluated in terms of freight traffic that was reduced due to their access and loading restrictions and fees. Similar processes are probably going on in the limited traffic zone of Piacenza in Emilia Romagna. but the focus of the C-LIEGE measure in this case was not the setting up of the LTZ (which has existed in Piacenza for quite some time) but the regional harmonization of LTZ regulations across the region. Therefore the impacts stem primarily from the positive

influences this regionalisation of regulations has for local freight operators' investment decisions to purchase more eco-friendly vehicles – and not only service the LTZ with them but the city at large. The measure in Leicester is actually pointing in a similar direction. It also aims to influence operators' investment decisions and urge them to use low emission vehicles in the city centre. However, as pointed out before, Leicester follows a more incentive based approach - offering better conditions for using loading bays and the privilege of using the bus lanes on arterial roads in return for using the more environmentally friendly freight vehicles.

The second group of measures follows the 'aiding the (un)loading process' strategy. The same measure – setting up a small number of loading bays on or near a busy commercial street shows strikingly different impact levels. This is due to the fact that the two pilot cities are very much different in size. Tarxien has about 7,000 inhabitants while Szczecin has 400,000 inhabitants. Consequently the effects of the loading bays is related to a small overall volume of freight traffic, which thus creates very large relative impacts. As could be shown in the Final Evaluation Report (D6.3) of the C-LIEGE project it therefore also makes sense to shift the level of analysis (in this case for Szczecin) and also analyse impacts at a more local level. In any case, the loading bay measure clearly seems to be effective even though it is a very simple (and inexpensive) transport measure.

The last group of measures shown in the table only consists of one C-LIEGE measure, which followed the 'consolidation of deliveries' strategy. In this particular case only a few pack stations were relocated to more accessible locations and one new station was opened. The positive effects in absolute terms can be seen when looking at the freight vehicle kilometre indicator. All other indicators were expressed in relative terms – which in a fairly big city like Szczecin reduces the impact values. Again, a more local analysis as was also conducted in D6.3 shows the significance of this and similar measures at the local level.

2.3. Aiding the transformation of the urban freight fleet and its operation

2.3.1. Overview

The third general approach of soft urban freight transport measures seeks to influence freight operators to transform their freight fleet and vehicle drivers to change their driving behaviour in a certain way. Some measures address these transformations directly, like the Fleet Operators Recognition Scheme (FORS), other measures include components or sub-goals to this effect.

The following measures implemented and tested within the C-LIEGE project can be categorised as 'transformation oriented' soft measures:

- *Fleet Operators Recognition Scheme (Newcastle)*

  This measure aimed at improving freight operator performance and reducing negative impacts of freight traffic by instituting a scheme that awards fleet operators a certain status if certain operation requirements are met. FORS is essentially a free accredited membership scheme for businesses operating van and lorry fleets of all sizes. Its main contribution lies in the provision of independent advice and guidance which may motivate members to improve operation performance (in environmental, economic, social and legal aspects). Fleet Recognition schemes are voluntary schemes, thus usually free to join, designed to provide recognition, guidance and advice to road transport operators. An assessment is carried out of a fleet's overall road transport operation to recognise levels of legal compliance, operational and environmental performance and those complying with the required standards are branded accordingly. Thus the award of FORS medals exists as an incentive or mechanism to drive up standards in the freight sector and create positive impacts for the society at large.

- *Awareness raising and promotion campaigns (Leicester and Szczecin)*

  In Szczecin and Leicester awareness raising and promotion campaigns for sustainable freight transport were implemented using the internet and workshops. In particular an eco-driving guide was developed and disseminated in Szczecin, where the campaign is seen as a preparation for a possible future FORS scheme.

- *Electrical van sharing (Ludwigsburg/Stuttgart Region)*

  This measure aimed at primarily reducing environmental impacts of urban freight transport by using electrically powered vans for urban deliveries. Using electric

vehicles for local deliveries is not a new idea but has not found widespread application. Therefore this C-LIEGE measure intended to offer local business the possibility to rent or share an electric van for their short-distance urban deliveries. Therefore the measure included creating a viable business model for such a van sharing service, identifying a suitable company to coordinate and operate the service and develop a sharing/rental scheme attractive for local businesses.

- *Limited Traffic Zone (Piacenza)*

  This measure has already been described above. The key point in this context is that the issue of harmonization of access to Limited traffic zone is a tool to in the end influence freight operators to shift their vehicle fleet towards more energy-efficient and cleaner freight vehicles. Administrative simplifications of access regulations is important for operators that operate on a wider territorial scale, as these operators can now deal with a set harmonized rules on a regional scale.

- *Low emission zone (Leicester)*

  The same applies to the low emission zone in Leicester, which has also been described already. Like in Piacenza, local decision-makers are using the low emission zone approach and related incentives for fleet operators to convert their vehicle fleet towards less emitting freight vehicles.

2.3.2. Strategies

The measures of this approach could be categorised into four strategic types:

The first type consists of a strategy of directly addressing and rewarding the conversion of an operator's freight fleet towards cleaner vehicles as well as changing the day-to-day fleet operation. The FORS scheme in Newcastle can be considered a prototype of this strategy. Fleet conversion and changes in the practice of operating the fleet are not by-products but the core of this measure. Various sub-strategies are used to this end, like officially rewarding good practice, giving advice and guide operators to adopt higher standards not only in regard to environmental aspects but a whole range of relevant aspects. FORS schemes are voluntary in nature, but it is possible to e.g. build certain requirements into the public procurement process or the building permission process that would favour FORS accredited operators and thus constitute economic incentives to join FORS.

The second type of measures takes an even more active role and seeks to initiate and develop commercially viable projects that utilise environmentally friendly freight vehicles or delivery systems. In the C-LIEGE project the electric van sharing measure coordinated by one of C-LIEGE's pilot partners is a case in point: The idea was to not only promote the idea of using electric vehicles for short-distance goods delivery, but to bring together potentially

interested stakeholders and develop concepts and practical models. This process or role could be compared to that of a mid-wife in that the coordinator's task was to bring to life a new and sustainable project that uses electric freight vehicles.

The third type of measures of this approach is trying to indirectly bring about fleet conversions. The Limited Traffic Zones rules harmonization in Emilia Romagna or the low emission zone in Leicester also can be considered in this respect. While their primary objective is to bring about environmental and traffic improvements to a particular area in the city centre, they also leverage their position as 'gatekeepers' to a very important freight destination to bring about wider changes in the vehicle fleet in their respective city.

2.3.3. Impacts

The impacts of these measures are more difficult to capture than the previous types of measures, because they involve a lot of soft tools like persuasion, providing training, giving advice etc. Therefore these measures can at least in their early stages not demonstrate large scale effects, as the table below shows.

2013 Soft measure impacts (city level)		**Performance indicators**			
		Vehicle kilometres	**Pollutant emissions**	**Fossil fuel consumption**	**Freight operating costs**
	C-LIEGE targets	***-10,000 km***	***-10.0%***		***-8.0%***
Newcastle	FORS scheme	0 km	-0.8%	-0.8%	-0.2%
Stuttgart region	Electric van sharing	0 km	-0.14%	-0.15%	0.0%
Piacenza	LTZ harmonization	0 km	-3.5%	-2.5%	-1.1%
Leicester	Environmental zone	0 km	-14.7%	-10.0%	-6.2%

Table 4: Impacts of 'transformation of freight fleet and operation' soft measures

The FORS scheme in Newcastle is actually a very methodical and comprehensive undertaking that benefits a lot from the long and very successful experiences of FORS London. Based on this reference projects it can be projected with fairly high confidence that the currently relatively low impacts will significantly increase from year to year. How far these impacts will extend probably depends a lot on how much the public sector as a whole in

Newcastle will adopt and promote FORS as a key element of their transport, procurement and development planning processes.

The electric van sharing measure is a very ambitious measure, but also needs time to take root and then expand in the city where it is undertaken. But even when 'fully matured' it might still be a niche project for a particular type of locally oriented retail freight traffic. Much will probably depend on whether such a small scale undertaking can influence and 'infiltrate' larger commercial freight operators who provide services in the city and slightly beyond.

The LTZ harmonization and LEZ measures in Emilia Romagna and Leicester have high impact potentials because, as explained above, they have the opportunity to possibly influence a much larger share of the vehicle fleet operating in their cities because they 'regulate' a very prominent and sizeable component of overall freight transport already. How large the spread effect will in the end be still needs to be determined and tested. For the case of Emilia-Romagna a regional impact evaluation was already performed (see D6.3).

2.4. Connecting, coordinating and planning with freight stakeholders

2.4.1. Overview

The fourth approach of soft measures analysed and promoted with the C-LIEGE project relates to connecting, coordinating and planning with freight stakeholders. These measures do not aim to make tangible impacts on urban freight traffic as such, but serve as enabling, supporting, facilitating measures that initiate or enhance other measures or promote issues of urban freight traffic more generally – in particular through involving local stakeholders. This is why they were called 'horizontal measures' in the C-LIEGE project.

The following measures implemented and tested within the C-LIEGE project can be categorised as exemplary horizontal soft measures:

- *Freight Quality Partnerships (FPQ)*

  Freight Quality Partnerships bring together public and private stakeholders in order to jointly advance common issues and joint projects in the urban freight transport sector. The specific institutional form, intensity and operation of the freight quality partnerships differs greatly between the pilot cites, owing to the fact that sometimes a partnership already existed or only had to be reinvigorated whereas in other cities a partnership had to be created from scratch.

- *Local freight development plans (LFDP)*

  A local freight development plans is on the one hand a particular planning document that lays down strategic goals and measures for their achievement. On the other hand developing such a plan is an institutional process that also brings together individuals and organisations from different backgrounds that nevertheless share a particular interest in urban freight transport issues. As with the FQP the 'baseline' status of the LFDPs differed greatly between the C-LIEGE pilot cities. Some pilot cities already had a detailed and enacted plan which only needed to be updated, modified or further specified. Other pilot cities were at the beginning and needed to start with an analysis and discussion of urban freight transport issues with local stakeholders.

- *City Logistics Manager (CLM)*

  A city logistics manager is responsible for planning, managing and coordinating the traffic of goods in cities with the aim of improving efficiency and effectiveness, in a perspective of environmental, economic, energy and social sustainability. He can be seen as an initiator and coordinator who tries to facilitate exchange among stakeholders, provides guidance and supports particular projects in the urban freight transport sector. In the C-LIEGE pilot cities there were again different preconditions leading to very different solutions as to where and with what functions the city logistics manager is embedded in the UFT landscape.

- *Rail freight development group*

  The rail freight development group in Newcastle brings together local authorities, rail operators, the private sector and university transport researchers in order to encourage modal shift from road to rail. This 'rail freight development group' focused on two harbours and corresponding rail lines, which have potential for increasing rail freight traffic. The rail freight group met several times during the C-LIEGE project duration and is exploring ideas how to make us of and expand rail freight traffic in the region. However, at this point no concrete plans or ideas have been developed that could be evaluated in terms of (potential) impacts.

2.4.2. Strategies

The above described measures are almost prototypical for different strategies. These strategies can be summarised in the following way, each closely connected with one of the above horizontal measures:

Network creation: This strategy is mainly employed by the freight quality partnerships. Of course the partnerships pursue specific goals and even implement concrete projects. But the core idea of the FQPs is the sharing of information and experiences, enhancing understanding among the members and binding persons and institutions with diverse backgrounds together. Joint projects may be initiated and implemented to achieve specific goals, but the institutional aspects are often just as important as the concrete actions. In its fullest form this strategy brings a new institution into being that is more than a loose network that exists primarily when joint meetings are called – like a round table group that meets from time to time. A full institution would include all this, but have created permanent organisational structures, official goals and bylaws and might even have a permanent or part-time coordinator or office that runs the institutions affairs on a continuous basis.

Initiating and coordinating: This is the main strategy underlying the work of the city logistics manager. It is clear that this is a strategy pursued by a single person who tries to advance the urban freight transport sector in a particular city. Naturally the logistics manager would be embedded in an organisation and he or she would also try to be involved in or create networks. But at its core this strategy starts from and comes together in one person. The CLM studies the demand for UFT in order to ensure the necessary level of service, while minimizing congestion, pollution, accidents and, possibly, transport costs. The City Logistics Manager would be responsible for planning, managing and coordinating the traffic of goods in cities with the aim of improving efficiency and effectiveness, in a perspective of environmental, economic, energy and social sustainability. A fundamental task relates to creating a baseline scenario of urban freight transport which will service as the basis for developing a UFT strategy. Finally, the City Logistics Manager would initiate and coordinate the permanent stakeholder process dealing with urban freight issues. It thus becomes clear already, that the CLM would be closely interlinked with the other two major horizontal measures, namely the development of the Local Freight Development Plan and the Freight Quality Partnership.

Goal oriented planning: Of course this strategy is being followed by the local freight development plans. In contrast to the FPQ and the CLM the LFDP is a process that leads up to a specific output, namely the LFDP plan document. Of course the process of developing the plan has at least a medium term duration and might therefore take on quasi institutional characteristics. Nevertheless, whenever the plan has been produced this process has come to a (preliminary) end. Of course the process can be restarted, e.g. to follow up or update the plan later on. But it is clear that such a process has a different raison d'etre than a partnership which in a way 'rests in itself'.

2.4.3.Impacts

It is very difficult to identify and capture the impacts of 'horizontal' soft measures in the field of urban freight transport. A simple answer would be to say that many of the 'vertical' measures described in the previous sections at least contain or completely are the impacts of the horizontal measures. But it is difficult to precisely determine to what degree a measure has been the product of e.g. a freight quality partnership. Nevertheless, looking into the future, e.g. until the year 2020, it is clear that especially the freight quality partnerships and the city logistics manager will have *some* impact – but how much?

Based on the experience of the existing partnerships and the measures implemented during the C-LIEGE project it was assumed for a conservative estimate that a) a freight quality partnership is able to develop and implement at least one urban freight measure completely on its own every two years and b) a city logistics manager develops and implements most measures in conjunction with freight quality partnerships (or other institutions) and therefore only has about one third of the impacts of a freight quality partnership (whose impacts are used as the main reference point). The table below summarises the estimates for the year 2020, i.e. seven years from now, on the basis of three implemented average measures (2013 impacts) and adjusting for the different sizes of the C-LIEGE pilot cities.

	2020 impacts (city-wide)	**Performance indicators**			
		Vehicle kilometres	**Pollutant emissions**	**Fossil fuel consumption**	**Freight operating costs**
Leicester	Freight quality partnership	-9,887 km	-7.4%	-6.1%	-3.3%
	City logistics manager	-3,296 km	-2.5%	-2.0%	-1.1%
Newcastle	Freight quality partnership	-9,065 km	-7.4%	-6.1%	-3.3%
	City logistics manager	-3,022 km	-2.5%	-2.0%	-1.1%
Stuttgart	Freight quality partnership	-16,554 km	-7.4%	-6.1%	-3.3%
	City logistics manager	-5,518 km	-2.5%	-2.0%	-1.1%
Szczecin	Freight quality partnership	-11,204 km	-7.4%	-6.1%	-3.3%
	City logistics manager	-3,735 km	-2.5%	-2.0%	-1.1%
	Freight quality partnership	-5,194 km	-7.4%	-6.1%	-3.3%
Montana	City logistics manager	-1,731 km	-2.5%	-2.0%	-1.1%
	Freight quality partnership	-4,598 km	-7.4%	-6.1%	-3.3%
Tarxien	City logistics manager	-1,533 km	-2.5%	-2.0%	-1.1%
	Freight quality partnership	-6,125 km	-7.4%	-6.1%	-3.3%
	City logistics manager	-2,242 km	-2.5%	-2.0%	-1.1%

Table 5: Potential impacts of freight quality partnerships and city logistics managers

Of course the impacts of partnerships, multi-stakeholder planning processes and a city logistics manager are probably much wider and deeper than such estimated tangible impacts. Two types of deeper, intangible impacts are especially important:

Cognitive impacts: These impacts relate to gained knowledge and learned skills. Undoubtedly the individuals and institutions taking part in the horizontal measures described above learn a lot in their process of involvement. This could be getting unique access to information or even data that one did not even know about before. It could be learning certain skills e.g. at workshops or by taking part in a particular analytical, planning or implementation process. Or it could be new ideas, creative solutions, novel approaches that come about when different persons or organisations are coming together with the shared interest to improve a certain issue in urban freight transport. Thus these cognitive impacts really extend beyond the personal and can really become collective impacts.

Psychological impacts: These impacts relate to emotional needs and potentials that are – usually unconsciously affected by the kind of group processes described above. Participants in round tables, network meetings, partnership committees, planning circles and coordination meetings are affected not just as institutional representatives, as experts or economic actors. They are at the same time affected on a personal level: they feel supported, encouraged, motivated, intrigued, baffled, surprised, agitated or even outraged. The longer the horizontal measures and the institutions created by them are sustained, the more likely it is that the persons involved in them over a longer period of time will give each other support and 'feed off of each other'. These can be very important impacts – especially when someone feels that the organisation he or she belongs to is e.g. open minded, creative, productive and attentive. In that case a more flexible, informal and open institution like e.g. a freight quality partnership can become an important outlet, support or source of motivation.

Such impacts are not just a by-product or are less important than the tangible results that e.g. a city logistics manager or a freight quality partnership produces. In the long run it is probably more important for institutional measures that its members or participants get something out of the meetings, communicative processes and events that satisfies, inspires and empowers them personally – or else the newly created roles and organisations soon become uninteresting and a waste of time.

For soft measures in the field of urban freight transport it is very important to consider these intangible impacts, because soft measures require new thinking, creativity, risk taking and joint action – because soft measures often are a break from conventional solutions and established practice.

3. Successful implementation of urban freight transport soft measures

The preceding chapter focused primarily on the impacts of 'soft' urban freight transport measures that were piloted by the C-LIEGE project. The following chapter addresses the implementation of these measures. It summarises the results of the initial, interim and final monitoring reports (produced by C-LIEGE partner IMPERIAL), which were based on detailed monitoring data collected from each pilot measure.

3.1. Typical implementation conditions

The following section focuses on the most important conditions that influenced or shaped the evaluated pilot measures. Commonalities were identified regarding political conditions, stakeholder relations and existing urban freight transport data, strategies and projects.

3.1.1. Political conditions

Strong and sustained political support of urban freight transport measures

Some pilot cities (not all) were characterised by a long history of strong and sustained political support for innovative interventions in the area of urban freight transport. This includes, for example, the Italian region of Emilia-Romagna and its major cities, which have been European pioneers in urban freight transport for many years. Likewise Newcastle and Leicester in the United Kingdom have pursued freight transport as an important transport policy area – and developed the necessary institutions accordingly. In the city of Montana, the C-LIEGE awareness raising campaigns also activated strong political support for an active municipal role in regard to freight transport – strong enough to legislatively introduce very significant charging schemes. Another example is Szczecin which succeeded to attract political attention beyond the pilot city on a regional level, gaining the full support of the Marshal of West Pomerania, and signing an agreement with the Mayor of Stargard Szczecinski who agreed to follow in the footsteps of Szczecin. It thus became the first city outside the C-LIEGE pilots to apply the C-LIEGE soft measure portfolio. Such strong and sustained political backing (ideally at the local and regional level) is very conducive for further and more innovative measures – on top of those tested within the C-LIEGE project.

Political instability or heterogeneity

On the other hand, a number of pilot cities reported that their political environment was – during the C-LIEGE project duration – marked by political instability. For example the regional and local government of the C-LIEGE pilot Stuttgart experienced a major political change for the first time in decades. Likewise the implementation of measures in Hal Tarxien on Malta was affected by local elections and the preceding campaigning period. In such

instable or changing political conditions it is very difficult to implement novel measures, which have the potential to generate conflicts with local companies or residents. Therefore public and multi-stakeholder discussions as well as political and administrative decisions were delayed or stalled – with negative consequences for the implementation of the pilot measures.

Public budget austerity

Virtually all pilot cities were implemented within a climate of public austerity, characterised by very tight or even decreasing public budgets of the respective municipalities. This typically results in a concentration of 'tried and tested' and absolutely necessary public actions. It was therefore sometimes difficult to convince decision-makers to consider or even fund new approaches to dealing with urban freight transport. What might have saved some C-LIEGE measures is that in relative terms they are often not as costly as other, more traditional, 'hard' measures. But even soft measures are not for free and require appropriate funding (see further below).

3.1.2.Stakeholder relations

The following conditions relate to the linkages between key stakeholders in the urban freight transport sector. As opposed to the political, governmental aspects characterised above, the following aspects address the wider 'governance' of freight transport in the pilot cities.

Diverse interests and perspectives

An almost ubiquitous condition reported for every pilot city is the great diversity of key stakeholders. Public institutions, private freight operators, retailers, manufacturing firms as well as local residents naturally have very different interests when it comes to specific freight transport issues. A particular freight transport measure may create a benefit for one group but be a detriment to another group. The fault lines may even run within the large groups of actors mentioned above: small versus large freight operators, one public facility versus a particular municipal agency, residents along one street versus residents of another street and so on. Acknowledging these diverse interests and perspectives on particular transport measures and finding win-win solutions or at least acceptable compromises that will hold over the lifespan of a measure is a highly challenging task and requires great social/political skills and innovative ability.

History of local and regional cooperation

Several pilot cities or even regions had a history of successful cooperation in the (freight) transport sector. For example, the two English pilot cites, Leicester and Newcastle both had freight quality partnerships that brought together public and private actors. The partnership in Leicester had over time lost its initial vitality but it was reinvigorated by the new initiatives and

measures that were supported by the C-LIEGE project. Cities in the Italian region Emilia-Romagna, while competitive in general, had also cooperated e.g. within the framework of European transport studies and pilot projects. The Stuttgart region in Germany has a long history of comprehensive regional cooperation and there is one institution, the Stuttgart Chamber of Commerce, who initiated and manages a regular round table on freight transport issues in the region. In all of these cases these existing governance linkages provided an important foundation for discussing and then implementing new transport measures and for enhancing old or creating new institutions.

Little cooperation, no exchange platform and no lead institution

However, in general the opposite governance conditions could also be found in the C-LIEGE pilots: a) Little or no cooperation between stakeholders, most importantly between the municipality and local freight operators, b) no institutional platform for the key freight transport actors to (regularly) meet and exchange ideas and positions, c) no institution which took a lead and initiated or coordinated the necessary dialogue between the stakeholders. Against this backdrop it was often the local C-LIEGE partner who took up the challenging task of talking to the key stakeholders individually and finally bringing them together in the C-LIEGE round tables. Thus dialogue and cooperation was in most cases developed almost 'from scratch', and the measures and institutions jointly developed under the umbrella of C-LIEGE became visible outputs of the changed local governance in regard to freight transport.

3.1.3. Existing data, strategies and projects

Apart from the broader political and institutional conditions summarised above, the pilot city also showed similarities (and also differences) in regard to technical and strategic aspects of urban freight transport.

Lack of freight transport data

In most pilot cities there were no comprehensive empirical data on freight traffic, e.g. based on a city-wide traffic survey. This seems to reflect a preoccupation of local transport policies with passenger transport, which makes up the great bulk of urban road traffic, and public transport in particular. The C-LIEGE project did not have funds for conducting or commissioning full scale traffic survey in the pilot cities. Only in the case of Hal Tarxien (a municipality of about 7,000 inhabitants) was it possible to conduct a traffic survey that covered a large part of local freight traffic.

Existing transport strategies and plans

Several pilot cities had comprehensive transport plans and strategic policy documents, but often these did not focus much attention on freight transport for similar reasons as mentioned

above. Another weakness of most of these planning documents is that goals, e.g. on traffic as such but also on environmental impacts, are usually not quantified. Often the C-LIEGE project was used to make up for these gaps and weaknesses and either create a stand-alone local freight transport development plan or supplement/integrate such issues in an existing transport plan.

Scepticism towards soft measures

A general experience that C-LIEGE partners reported was that many decision-makers, both in the public and private sector, are sceptical in regard to the significance or effectiveness of urban freight transport soft measures. Transport planners and freight operators seem to attach more relevance to 'hard' infrastructure measures and other big investments, whose results are more tangible. This is also reflected in existing plans and strategies that up to now often do not include soft measures or relegate them to low priority status. For this reason C-LIEGE round table talks had to spend quite some time to raise awareness about and make the case for considering and focusing on soft measures in general.

3.2. Typical implementation processes

The implementation of each freight transport measure implemented under the umbrella of C-LIEGE is of course unique. But when analysing the progress reports of all measures some typical phases and implementation processes can be identified that are shared by most projects. In the following these typical processes are structured into four 'bands' of activities that mostly run in parallel, even if there is a basic underlying sequence: goal setting and planning, stakeholder involvement and public relations, political and administrative decision-making, technical and institutional implementation and finally, operation, maintenance and ensuring sustainability.

3.2.1. Goal setting and planning

Data analysis and planning

According to the monitoring results two types of measures need to be distinguished. Some projects were already fairly advanced in terms of preparatory work when the pilot implementation stage of C-LIEGE started. For these measures most of the planning activities had already been completed and all involved actors were eager to more forward and start actual implementation.

Other measures were truly developed 'ex novo' during the C-LIEGE round table discussions and pilot phase. For these measures local actors had to start from scratch. Some of these measures went through a very thorough process of data analysis (e.g. in Piacenza/Emilia-Romagna and Malta) in preparation for proposing an action plan and making proposals to

other stakeholders and regulatory authorities. But most measures relied on very scanty data and had to quickly move to action planning and implementation.

Typical for this phase were jointly agreed plans, division of responsibilities and project work plans, but usually without very clear goal definition and specification of measurable targets and sub-targets. However, as part of C-LIEGE monitoring and evaluation each pilot city partner discussed and agreed (usually with other local actors) targets for each measure in regard to the C-LIEGE performance indicators, albeit as relative targets (e.g. 3% reduction of emission pollution from a particular measure). This exercise turned out to be quite challenging because targets always had to be set in relation to total freight transport in a pilot city – and stakeholders of a particular measure had difficulty in assessing the significance of the measure for overall freight transport in their city.

Identification of threats to the implementation and possible contingency activities were required by the C-LIEGE monitoring forms that pilot city partners had to fill out for each measure. While some of the identified threats were not very likely and did in fact not occur, some threats – especially in regard to required regulatory approvals or positive decisions by key implementation partners – turned out to be valid and did in fact affect the implementation (mostly in the form of delays.

Financial planning

First of all it has to be noted that C-LIEGE did not include a budget for financing the implementation of measures as such. There was funding for staff costs of the pilot city partners but not for investment costs or even sub-contracting e.g. for a traffic survey. Thus all costs for a measure had to be covered by own funds (of the implementing parties) or funding from outside sources – e.g. the municipality or other public bodies.

Measures that were already well advanced in the run-up to C-LIEGE's pilot phase had already dealt with financial issues and e.g. made an application for a measure to be included in the municipality's annual budget for 2013. However, other measures that were gradually planned and developed in the pilot phase which started in autumn 2012 did not have a chance to be included in the 2013 municipal budgets. This likewise applied to outside funding from public funding programmes that also have at least several months of 'waiting time' between proposal submission and grant approval. In fact, such financial planning issues became viable stumbling blocks or reasons for delays of several measures. It comprised an important lesson learned, that the required financial support for soft measures was underestimated – even if the required amounts are much less than for 'hard' infrastructure investments: even 'small' activities like producing a leaflet with information for lorry drivers, printing and disseminating it costs money, which needs to be sourced from somewhere.

Institutional planning

In some way each soft measure required some institutional planning, e.g. when deciding which organisation would take responsibility for which implementation activities etc. But for some measures institutional planning was even more important because it needed to be decided who would or could 'host' a certain measure. The 'ad hoc routing' measure in Stuttgart is a case in point, because in essence the traffic announcement and routing service is a long term engagement that needs to be 'housed' in a certain organisation which would then require the necessary staff and equipment to run the service. In such cases finding an institution that would be willing and able to take on the measure was perhaps one of the most important challenges (besides financing).

This also applied to many horizontal measures, most prominently the City Logistics Manager and the Freight Quality Partnership measures. In a way these measures were all about institutional planning: For example, the position of city logistics manager needed to be defined and 'rooted' in an existing organisation. And for the freight quality partnership a sort of constitution needed to be framed, discussed and agreed by potential members – apart from persuading organisations to become members at all. The C-LIEGE round tables and pilot city partner staff were the driving forces in these institution building processes. Without the lead of C-LIEGE staff these activities would in most cases not have taken place at all.

3.2.2. Stakeholder involvement

Involving key stakeholders in the area of urban freight transport in the planning and implementation of the C-LIEGE measures was a hallmark of the C-LIEGE pilots. This stakeholder involvement typically took place through the C-LIEGE round tables and the freight quality partnerships.

Round table meetings

In preparation for the C-LIEGE round tables the relevant stakeholders were identified in each pilot city based on a stakeholder engagement manual developed by WP3 leader KLOK. This helped with targeting and approaching the most important public and private institutions to be involved in the further process. On this basis a total of four round table meetings were conducted in each pilot city. Based on guidance from the work package leader, but still mainly driven by local needs and planning agendas these round tables discussed ideas, proposals and concrete plans for freight transport measures and their wider, regional implications and later on followed and discussed the implementation of measures. The round

table meetings also served to discuss and prepare the forming (or revitalisation) of freight quality partnerships and the institution of a city logistics manager in each pilot city.

Freight Quality Partnerships

As presented and assessed in Chapter 2 freight quality partnerships were started or existing partnerships revitalised in all pilot cities. Sometimes they are a kind of institutionalisation of the round table meetings that were held under the umbrella of C-LIEGE, in other instances they existed or were formed in parallel but separately to the round table meetings. The freight quality partnerships also involve the key public and private stakeholders in urban freight transport in the respective pilot city or region but have a longer, more strategic outlook than the round tables. Apart from this the partnerships also mark a major step in stakeholder involvement and urban freight transport cooperation in the pilot cities or regions in general because they represent a firm, public commitment of the stakeholders to cooperate on a sustained (instead of sporadic, ad-hoc) basis.

3.2.3.Political and administrative decision-making

As concerns political and administrative decision-making processes two types of processes proved to be typical and crucial during the C-LIEGE pilots, namely urban political or administrative decision making at the city level and regulatory approval processes.

Urban political and administrative decision-making processes

Most measures implemented during the C-LIEGE pilot phase required some kind of political or administrative decision to go forward with implementation – be that e.g. in regard to providing public funds or changing local traffic regulations. When such decisions were within the authority of the municipality, then political institutions like the city council or appointed political officers like mayor had to deliberate and decide on the measures. In contrast to the C-LIEGE round tables these political institutions had to consider the proposed measures within a much wider context. In effect, they had to weigh the benefits and costs of the measures vis-à-vis other (partly competing) political interests and projects. This also meant that general political orientations and strategies of the ruling majority in city councils and appointed leaders, like majors, came into play. For these reasons these political decision-making processes typically took longer and were more unpredictable than originally thought. Furthermore, political bodies sometimes opted for a very cautious approach before proceeding with measures, e.g. when they decided to commission an additional feasibility study or a more thorough analysis of the current situation and based on this only a temporary, pilot implementation. In general, the political processes tended to delay the implementation of measures – sometimes simply because of political schedules or due to inconclusive deliberations or required further actions as described above.

Regulatory approval process

In some cases (not all) the proposed measures also needed official approval from supra-local authorities. For example in Hal Tarxien all measures related to the use of public streets (including parking space on the side of the street) needed permission from the respective national authority (Transport Malta). Such regulatory processes turned out to be even more unpredictable and more serious in their consequences than the local level political/administrative processes discussed above. This was due to the fact that bureaucratic regulatory approval processes were less flexible and more remote to the 'implementation level' of the measures, i.e. they could not be influenced as much as the more flexible local decision-making processes.

3.2.4. Technical and institutional implementation

The implementation processes of the described C-LIEGE measures were of course very heterogeneous, owing to the different nature of the measures, which ranged from e.g. installing signs for an industrial estate to setting up a freight quality partnership. It is therefore difficult to identify typical features and patterns across all measures. Nevertheless, a few general technical and institutional issues are summarised below.

Technical implementation processes

Two different types of measures can be distinguished in regard to technical aspects. On the one hand there are measures that were not very complex to implement from a technical point of view. For example, installing street signs or relocating a packstation is not difficult to do. Thus the technical implementation as such did not require much time. On the other hand some measures' technical implementation was indeed very complex, e.g. developing an online freight map, designing and building a lorry petrol station or installing an intelligent traffic guidance system. Naturally the implementation of this type of measures took longer (sometimes was already started in the run-up to the pilot phase) and was also more prone to difficulties and thus delays – both due to 'endogenous' technical challenges and external influences on the implementation.

Institutional implementation processes

In regard to institutional implementation one needs to consider on the one hand those measures that are purely institutional in nature and those that are not primarily institutional but whose implementation nevertheless had some institutional aspects. The first category comprises primarily C-LIEGE's so called horizontal measures like the developing freight quality partnerships, local freight development plans and creating the position of city logistics managers. In these cases the whole discussion and planning process and the institutional implementation as such are highly intertwined. In a strict sense the implementation finally consisted of a final decision to e.g. form a partnership or the signing of a document that

officially instituted the partnership. All processes that follow on from there are an on-going implementation of this institution, e.g. setting up rules of operation, appointing officers, having regular meetings, developing, discussing and agreeing long-term plans etc. Thus, unlike more technical measures, for purely institutional measures the implementation does not really stop at a certain point; it is a continuous and dynamic process. But even more technical measures as described in the preceding section often include institutional aspects. For example, for the electric vehicles measure the most crucial aspects of the implementation were in essence institutional: creating a viable business model for the service, negotiating with a potential service provider, enlisting potential customers of the service etc. With varying degrees this applies to almost every measure, for even the implementation of 'purely technical' measures like relocation of packstations or creating loading bays require institutional supporting actions, like - to take up one of the above examples - getting permission or signing agreements with landlords for setting up the packstations in the new locations.

3.2.5. Operation, maintenance and sustainability

After implementing a measure there comes the phase of operation (including maintenance). In the case of C-LIEGE, most measures have just been implemented and it is too early at this stage to derive any conclusions in terms of even short term operation let alone long-term operation. It is already clear, however, that for almost all measures the updating and maintenance will be crucial, otherwise the measures could soon be outdated and useless or inoperable. For example, the various freight maps that were developed during C-LIEGE need to be updated regularly or they use their value to lorry drivers. Furthermore, the websites on which they are hosted need to be maintained and the smartphone based applications be updated and further developed as technology and user needs progress. Or, to take a different example, the ITS system set up on Szczecin's bridges needs to be technically maintained and improved in order to ensure its reliability and effectiveness for drivers.

Institutional measures likewise need to be 'maintained' or they lose their meaning and functionality. If a freight quality partnership is not 'filled with life' by way of regular meetings, joint activities and continuous coordination, it ceases to be an active institution and becomes only an institutional shell. The same applies to the city logistics managers whose usefulness is only maintained if the appointed organisation or person actively performs the functions that were defined for this coordination role. Existing experience in the pilot cities with such institutional measures (e.g. the freight quality partnerships that were started prior to C-LIEGE in Leicester and Newcastle) indicate that institutional sustainability certainly is not a self-propelling process but needs to be constantly 'nurtured'.

3.3. Key factors for successful implementation

The following factors have been key to the success of 'soft' urban freight transport measures in the C-LIEGE pilot cities. In a way, they could therefore also be considered recommendations to other cities where similar measures are contemplated.

3.3.1. Institutional factors

Local embedding of new measures and functions

The first institutional success factor relates to fitting new measures, institutions and functions that introduce novel soft approaches to urban freight transport in a city into the existing institutional 'landscape'. In this way a measure can build on experiences, linkages, resources and the durability of existing institutions and avoid the challenge (or risk) of having to create ex novo all the conditions that are necessary for early implementation and long-term sustainability. It is therefore necessary in the beginning to conduct a thorough assessment of existing institutions' functions, strengths, weaknesses and potentials in order to determine if and where a certain measure could best be embedded. But even if after such an analysis a measure requires a completely new institution (like e.g. a freight quality partnership) that is to a large degree independent (and thus neutral) vis-à-vis existing institutions, it is necessary to very carefully integrate it into the existing web of relations. This local embedding is especially crucial for soft urban freight transport measures because they are often new and innovative and have a high institutional component – whereas hard measures e.g. transport infrastructure investments are often more technical in nature, are more 'familiar' to local stakeholders and often already have clear institutional responsibilities.

Clarifying linkages between key institutions and tools

Related to the above, another important success factor is to identify, clarify and possibly redefine linkages between existing and also new institutions and tools that are created or modified by a soft urban freight measure. The C-LIEGE experience showed that e.g. creating a new freight quality partnership or a city logistics manager or developing a new local freight development plan are major achievements – but they are 'hanging in the air' and lose some of their potential effectiveness if it is not clearly defined how these institutions relate to each other and to other existing institutions and tools. For example, how does a newly developed local freight development plan (LFDP) relate to an existing overarching transport strategy of a city or how will it be integrated into the official land use and development plan? And will the LFDP be the basis for further planning and implementation by the newly created freight quality partnership – or will the partnership be charged with updating and further developing that plan? Or how is the city logistics manager related to the freight quality partnership? There are no clear cut answers and standard recipes to these and similar questions. But the success of soft measure oriented institutions and tools greatly depends on the fact *if* these linkages have been clearly determined.

Early involvement of political and regulatory actors

There are several examples within the C-LIEGE project where political and regulatory processes significantly prolonged or counteracted the implementation of soft measures. This could to some degree be avoided if the stakeholders, who are invited into and involved in collaborative processes and institutions, also comprise representatives from these overarching political and bureaucratic institutions. In this way it would become obvious much sooner if there are reservations, opposition or major stumbling blocks that need to be taken into consideration right away – instead of spending time developing a proposal and then having it officially rejected weeks or months later. Such an early involvement would also open up communicative avenues to these overarching bodies and processes and thus enable a process of debate and better understanding in both directions – which is very important for novel solutions like the soft measures presented in this report.

Nested system of local and regional urban freight transport cooperation

Another success factor addresses the different spatial levels that have a bearing on local freight transport solutions. This builds on the realisation that local freight transport is of course determined not only by local factors but also by overarching regional – in fact even national and international factors. Several C-LIEGE examples showed how the success of a measure can be greatly helped by e.g. a regional or national government's plan or strategy that supports soft measures as a complement to traditional hard measures. Likewise stiffer EU legislation that put pressure on local authorities to reach certain environmental targets make local actors more open to exploring new measures in support of these targets. Furthermore, many freight transport problems cannot be solved by simply local solutions - or their costs can be reduced if shared by several municipalities (e.g. a city logistics manager, or transport monitoring centre that serves a larger urban area). In a most remarkable example the C-LIEGE measure in the Emilia-Romagna region in Italy showed how local freight transport measures need to be harmonised at the regional level, how this can be done and what positive impacts it has on the freight transport industry and the participating cities. All these aspects point to the necessity to creating a nested system of local *and* regional cooperation, which are interrelated and reinforce each other but also deal with issues from a distinctly different vantage point.

Comprehensive and issue-specific cooperation

Below such local and regional cooperation issues, but not less important, is the lesson that the manifold communicative and participatory processes that were created or coordinated by C-LIEGE activities require further differentiation. In order to make communication and cooperation more efficient and avoid 'over-communication' and subsequent withdrawal of actors it is sometimes necessary to have parallel, interrelated but nevertheless separate platforms for overall, comprehensive problems and solutions and for issue-specific purposes or even measure-specific purposes. But this also calls for more coordination to shuffle up (or down) the issues and results of the various groups and cooperative institutions. This

important function could be performed by the city logistics manager or the coordinator of the freight quality partnership.

Mentoring between cities

Besides cooperating with cities in the near vicinity or located in the same region (see above) another successful strategy employed by the C-LIEGE project is the mentoring between cities that are far apart from each other but share some other commonalities. This could be similar problems or conditions or experiences with measures that are contemplated in the other city. The latter was the case in C-LIEGE where e.g. several pilot cities were able to benefit from diverse experiences with online freight maps in Leicester and Newcastle – or with freight quality partnerships in these same cities. On the other hand, Newcastle greatly benefited from the successful experiences with the fleet operator recognition scheme in London. Such mentoring or exchange of experiences has several positive impacts, for example it encourages local initiators to move forward with a measure, it provides a demonstrable example to convince other actors, it provides benchmark figures, proven procedures, templates and technical solutions that can often be adopted or adapted to the specific conditions in the mentored city.

3.3.2. Strategic and technical factors

Besides the above discussed institutional and financial factors there are several success factors that regard strategic and technical issues. On the one hand they have to do with how specific measures are best implemented or what approach should best be taken to planning, implementing and sustaining them into the future. On the other hand there are factors or approaches that have proven successful for the overall strategy of introducing and managing soft measures in a city.

Data and monitoring of freight traffic

A key success factor (which actually often did not exist in C-LIEGE pilot cities and therefore made everything more challenging) is sound baseline data in regard to freight transport in the city. This not only relates to freight traffic surveys but also surveys of the existing vehicle fleet of local freight operators. Curiously most transport data that municipalities have deal with passenger traffic and public transport, where municipalities see a special responsibility for engagement or for providing public services. It is however difficult to identify and pinpoint specific freight traffic problems and to adequately tailor the right measures (be they soft or hard) if up to date and detailed data on freight transport in a city are missing. Some C-LIEGE pilots reacted to this and conducted their own survey – but this was only possible in the case of very local measures. Ideally freight traffic monitoring should be a continuous or at least regular activity that is coordinated either by the municipality, the city logistics manager of the freight quality partnerships.

Combining hard and soft measures

Soft measures and hard measures for improving local freight transport should not be seen as opposites or even competing. While the C-LIEGE project concentrated on soft measures (because hard measures are already well known and often institutionalised), its intention was not to downgrade or disregard hard measures. Clearly, new approaches and investments e.g. in the local transport infrastructure and the freight vehicle fleet are highly effective means to influence traffic patterns and reduce environmental and operating costs. While some of these hard measures and a number of soft measures are quite successful independent of each other, it should in fact be clear that both types of measures can very much benefit from each other – and are best planned and implemented in combination. For example, what is inter-municipal cooperation for an optimised location of a lorry petrol station worth if the petrol station was not constructed? Or is it not best if traffic monitoring and congestion announcements to lorry drivers automatically feed into the existing urban traffic infra-structure, in this case the management of traffic lights on major arterial roads? And of course the institutional soft measures of city logistics manager, freight quality partnership or even local freight development plan would not exclude but definitely include hard measures in their repertoire.

Integration into commercial solutions

Several soft measures that were developed and implemented in the C-LIEGE project required intensive experimentation and learning due to their being innovative and new. Often this meant that they were primarily financed by public sector organisations or programmes that did not expect a commercial benefit from these measures. And clearly, if such attitudes, conditions and 'room for experimentation' had not existed it is not clear if the measures would have been implemented or brought to a successful stage. The downside to these experiments is that they can sometimes end up being isolated from the 'real world' of commercial freight operators and lorry drivers (see also further below). Or they might be insular solutions to larger problems that actually call for larger than local solutions. The highly innovative smart phone application for freight routing that was developed and implemented in Leicester is an excellent case in point. The phone app is undoubtedly an innovative and effective tool that can be of great value to lorry drivers, freight operators and the general public alike. However, in reality practically all lorry drivers already have a routing application that they rely on for their driving, namely satellite based navigation systems. These are commercial solutions to the routing and guidance needs of lorry drivers – and they cover not just individual cities but all cities in a country and Europe as a whole. It is therefore difficult to persuade drivers to use a parallel routing device (in this case on their smart phone), which in addition is only relevant for one particular city. Therefore, in order for certain soft measures to have a greater effect it is necessary to move successful local innovations to supra-local and commercial levels. Thus, it has to be explored how the information and features of Leicester's smart phone app can be taken up and integrated into the existing commercial

satellite navigation systems – and how comparable information can be developed in other municipalities and likewise be fed into existing satnav solutions.

Dissemination and marketing are crucial

Many soft measures tested in the C-LIEGE project are voluntary in nature, i.e. they do not force freight operators of lorry drivers to change their business operations or driving behaviour. Instead these measures seek to 'win over' operators and drivers. However, this assumes that the target groups of these measures first of all are aware of the offered services and know how to access and use them. Thus, in order to be effective and really make a large-scale impact it is crucial to spend considerable time, effort and hence also money on dissemination and 'marketing' of these non-profit services. For this it is not enough to simply put up a website, but active outreach activities have to be undertaken to really get in contact with freight operators and lorry drivers and convince them of the usefulness of the respective measure. Such outreach activities at the same time serve the purpose of gaining a better understanding of the freight sector and its actors and receiving valuable feedback on their needs, wishes but also hesitations and opposition to certain measures. This is particularly important for soft urban freight transport measures, because unlike more traditional hard measures most soft measures can only achieve effectiveness through persuasion and subsequent voluntary uptake.

Short-term piloting

Soft urban freight transport measures often face scepticism – not only from private operators and drivers but also from public officials and residents who believe that only hard measures really create tangible effects. Reducing that scepticism and convincing public and private stakeholders to adopt new measures is sometimes an almost insurmountable challenge that stops these measures in the early planning phase. To counter this problem one can make use of another characteristic of soft measures, namely that many of them are more flexible than hard physical transport measures. This opens up the opportunity to conduct a pilot or short-term test period through which experiences (and monitoring data) can be built up and doubtful actors be persuaded by demonstrated effects. This strategy was, for example, successfully applied in Hal Tarxien, the C-LIEGE pilot city on Malta, where opposition to proposed measures was at times stiff – not least on the part of regulatory agencies. Using short-term pilots gives both the promoters and those opposing a measure a chance to check the validity of their arguments – and in the end possibly gain new insights or recognise opportunities for optimisation or compromise. For these reasons the relative flexibility of many soft measures should be as much as possible utilised for real world testing.

Emphasising benefits to freight operators and freight vehicle drivers

Physical transport measures, but also regulatory measures (like access restrictions to certain areas of a city) are de facto changing the traffic reality for drivers. They do not need to convince but enforce traffic changes through hard facts. Most soft measures, as pointed out

above, require persuasion in order to be effective. And the most convincing argument is a real, tangible benefit for a potential user or 'adopter' of a measure. For this reason it is vital when planning and implementing soft measures to always have freight operators and vehicle drivers in mind and what specific benefits they could derive from a measure. Thus, for example, one should emphasise the benefits of a new loading bay in order to counterbalance the disadvantages of stricter enforcement of no double parking in a busy shopping street – or make sure to begin with that the measure does not purely entail disadvantages to the vehicle drivers (e.g. only stricter traffic enforcement without any loading bays). This sometimes requires a changing of perspectives on the part of the general public or municipal planners who might primarily have the intended effect in mind (e.g. less freight vehicles causing congestion). Another benefit or incentive to freight operators can be high value speakers, events or training sessions that address specific needs. If such incentives are bundled up e.g. with the membership in a fleet operators recognition scheme then this scheme will be more positively perceived. Making measures attractive and 'user friendly', i.e. creating also clear benefits to freight operators and freight vehicle drivers, greatly helps soft measures being taken up and sustained in the long run.

Engaging all public sector organisations

In parallel to having private operators and drivers in mind, another success factor focuses on the public sector. In almost every city public sector organisations like e.g. the municipal administration, hospitals, schools and universities account for a significant share of freight traffic. This potential (or freight transport demand) can be used to good effect if all these institutions follow certain guidelines that influence freight operators' behaviour. For example, all public institutions in a city could make provisions in their procurement procedures that freight services are only contracted from operators that meet certain standards (e.g. by requiring them to be members of a FORS scheme). This creates an indirect incentive for freight operators to transform their operations in the desired direction. Thus, soft measures can gain greater relevance and unfold greater effects if the public sector realises and uses its power as a significant freight market actor.

4. Conclusions and the transferability of measures

4.1. Summary of results

This report examined the results of both the process monitoring and the impact assessment of pilot measures conducted within the framework of the C-LIEGE project. The measures included a wide range of approaches and were implemented in seven pilot cities in six European countries, namely the United Kingdom, Germany, Poland, Bulgaria, Italy and Malta. Two previous reports (the Final Monitoring Report and the Final Evaluation Report) analysed each measure individually and at the pilot city level. This report analysed the measures across all pilot cities and grouped them according to their main strategic approach. Four main approaches were identified: a) routing and guiding urban freight traffic, b) managing the loading and unloading of urban freight, c) aiding the transformation of the urban freight fleet and its operation, and d) connecting, coordinating and planning with freight stakeholders.

Routing and guiding urban freight traffic

The first general approach of soft urban freight transport measures focused on routing and guiding urban freight traffic – not through physical improvements like better or new roads, but through providing particularly relevant traffic information, other incentives or regulations that aim to influence drivers' behaviour – both ad hoc and in the long term. Four types or specific strategies were distinguished:

The first type or strategy consists of creating restrictions for freight traffic so that vehicle drivers cannot use a particular street or access a particular area within the city. This is mostly used in order to ease traffic problems in particular parts of a city and/or 'protect' particularly sensitive population groups or facilities, like e.g. schools, hospitals or day care centres.

The second strategy consists of providing 'static' information about permanent obstacles, restrictions but also options and recommendations for freight vehicle drivers. Through special road signs or freight maps (in paper or various digital forms) the strategic aim is to keep problematic freight traffic away from sensitive facilities or population groups – but also to warn freight vehicle drivers of obstacles like low bridges, narrow roads or other restrictions and to help vehicle drivers find a better suited route or the best access to certain destinations.

The third strategy consists of providing real time information on current traffic conditions, in particular congestion or unforeseen obstacles. This requires continuous monitoring of traffic flows and effective communication channels to get the information to vehicle drivers.

The fourth strategy is about creating incentives to use (or not use) certain streets, e.g. by allowing freight vehicles to use lanes usually reserved for buses. Major incentive for drivers are typically that they can access a certain facility more easily, spend less time in heavy traffic or consume less fuel and thus have lower operating costs.

The cross-case analysis of these strategies and measures showed that they are able to create medium to high impacts – both at the city-wide level but also more locally, e.g. for particular roads or areas in a city where these measures are applied. Especially the more creative measures that use innovative incentives, disseminate information in innovative ways or provide previously not available information for freight vehicle drivers are very effective. These measures also hold great potential because many of them relate to *all* freight traffic in a city and could thus influence a lot of freight trips. If this can be achieved depends to a large degree on the dissemination/marketing activities that are employed in support of the measures.

Managing the loading and unloading of urban freight

The second general approach of soft urban freight transport measures focuses on the very last phase of a freight delivery: the last metres of a freight trip and the loading or unloading of freight. Typically these measures relate to goods delivery in the centre of a city where freight loading activities are in direct 'competition' with other traffic members in regard to road and parking space. Three more specific strategies were identified:

The first strategy consists of regulating access and (un)loading conditions in particular parts of a city. Typically a specific geographic zone is designated and closed e.g. for heavy goods vehicles. A softer approach tries to regulate primarily by differentiated access permission or loading fees. Access and loading regulations mostly also have a time component in that they only allow loading and unloading activities during certain time windows.

The second strategy consists of providing loading and unloading aids to freight vehicle drivers. Such support mostly comes in the form of loading bays, i.e. specially designated parking spaces that are reserved for freight vehicles loading or unloading goods. This gets the freight vehicles off the street (where they often used to double-park and thus create traffic jams). Or it avoids additional parking search traffic when lorry drivers circulate in the streets in search for suitable place to park their vehicle.

The third strategy consists of concentrating deliveries in central locations instead of delivering the goods to many individual addresses. Pack stations are the best example for this type of measure. The strategy is thus to consolidate freight trips and in this way save vehicle kilometres, driving time and consequently fuel, emissions and operating costs.

The cross-case analysis showed that measures following the main strategic approach of managing the loading and unloading of urban freight are very effective and have a significant impact on overall freight kilometres, pollution, fuel consumption and operating costs. At the core this approach is very straight forward and focuses on one of the most visible and concentrated parts of the freight transport delivery chain. But there is still quite some variation and innovation in the different mechanism of achieving these impacts, e.g. how the permission fee systems are set up, how loading bays are used as incentives and how regulations are harmonised on a regional level. In the end, several of these measures already use their particular interventions to also pursue an even wider aim, which is to influence the composition of the freight fleet in a city. Thus there is some overlap or synergy with the third approach of soft measures:

Aiding the transformation of the urban freight fleet and its operation

The third general approach of soft urban freight transport measures seeks to influence freight operators to transform their freight fleet towards more energy efficient and environment-friendly vehicles and encourage vehicle drivers to drive in a more environment-conscious way. Three types or particular strategies can be distinguished:

The first strategy consists of directly addressing and rewarding the conversion of an operator's freight fleet towards cleaner vehicles as well as changing the day-to-day fleet operation. For example a Fleet Operators' Recognition Scheme rewards fleet conversion and good practice, gives advice and guides operators to adopt higher standards not only in regard to environmental aspects but a whole range of other relevant aspects.

The second strategy takes an even more active role and seeks to initiate and develop commercially viable projects that utilise environmentally friendly freight vehicles or delivery systems. This can involve bringing together potentially interested stakeholders, developing concepts and practical models and finally supporting the start-up of eco-friendly freight projects.

The third strategy aims to bring about environmentally oriented fleet conversions in indirect ways, e.g. by offering special permissions regarding city centre access or special use of arterial roads when certain types of vehicles are used.

The cross-case analysis of impacts achieved by these measures indicates that this approach is indeed effective and produces desirable results but usually requires more than a short-term period to achieve changes of very significant level. This is due to the fact that freight operators can only be influenced indirectly and that freight fleet conversion is a medium to long term process because it requires sustained and very substantial investments by commercial freight operators.

Connecting, coordinating and planning with freight stakeholders

The fourth approach of soft measures does not aim to make tangible impacts on urban freight traffic as such, but serve as enabling, supporting, facilitating measures that initiate or enhance other measures or promote issues of urban freight traffic more generally – in particular through involving local stakeholders. Three specific strategies were identified and implemented within C-LIEGE:

Network creation: This strategy revolves around sharing of information and experiences, enhancing understanding among the members and binding persons and institutions with diverse backgrounds together. Round tables on urban freight transport and Freight Quality Partnerships are prototypical measures employing this strategy. Through such networks joint goals can be identified and concrete measures be implemented.

Initiating and coordinating: This strategy is embodied in the position of City Logistics Manager (CLM) that was created in the C-LIEGE pilot cities. A CLM aims to generate and monitor freight traffic data, develop and follow up new transport measures and initiate and coordinate stakeholder processes dealing with urban freight issues. The strategy of CLM is therefore closely linked with local freight development plans and freight quality partnerships.

Goal oriented planning: This third strategy also brings together local freight stakeholders but involves them in an output oriented process leading up to a final planning document – like a local freight development plan. This distinguishes this strategy from e.g. a freight partnership which is in principle a permanent institution and can also follow up and implement measures, instead of just planning them.

The cross-case analysis showed a wide spectrum of institutional set-ups for measures that followed the above described approach. The existing 'history' of local cooperation as well as the specific characteristics of major transport stakeholders in a city shaped the process of embedding such measures in the local institutional context. It is difficult to assess or forecast what tangible impacts these essentially institutional measures have on urban freight transport. Based on the experiences of the already existing partnerships it was estimated that freight quality partnerships are responsible for developing and successfully implementing on average one urban freight soft measure over a two year period. For a city logistics manager, who would most likely channel a lot of his efforts through the freight partnerships, it was estimated that effects on overall urban freight transport would be the equivalent of an additional one third of what the freight quality partnerships are able to achieve. In addition, several intangible cognitive and psychological impacts of these institutional measures have been identified. They are perhaps even more important, due to the fact that soft measures require new thinking, creativity, risk taking and joint action, because soft measures often are a break from conventional solutions and established practice.

Implementation conditions and processes

The report also analysed and summarised typical conditions and processes that were benefiting or limiting the success of the C-LIEGE soft measures. They are only enumerated briefly at this point, because most are addressed by the recommendations of the next section.

Political conditions were typically either very supportive of new and far-ranging freight transport measures or they were characterised by political instability and heterogeneity. A general condition that affected the implementation of soft measures was the austerity of public budgets. In terms of *stakeholder relations* the conditions were on the one hand marked by the very diverse interests and perspectives of relevant public and private stakeholders, making the introduction of new, often innovative soft measures a challenging task that required great social and political skills. In some pilot cities there was previously little cooperation between the different stakeholders and no 'platform' for exchange and no institution that took the lead in bringing all stakeholders together. Other pilot cities, however, already had a history of local and regional cooperation that had even culminated in joint institutions like freight quality partnerships. Conditions regarding *existing data, strategies and projects* on freight transport differed between the pilot cities but also showed many similarities. While several pilot cities had comprehensive transport plans and policy documents, only few of them paid attention to freight transport. Often the C-LIEGE project was used to make up for these gaps and weaknesses and either create a stand-alone local freight transport development plan or supplement/integrate such issues in an existing transport plan. This took place in the context of generally poor or not existing data on freight transport and also a general scepticism of decision-makers and private stakeholders concerning the usefulness or effectiveness of 'soft' urban freight transport measures.

Implementation processes of the C-LIEGE pilot measures included similar activities or phases, which nevertheless differed immensely in regard to timing and particular contents. Data analysis and planning needed to start from scratch for some measures, whereas other measures had already progressed very far in the run-up to the pilot phase. Financial planning likewise differed, because the new measures still had to seek or apply for funding, while the already advanced measures had already done so and could thus move forward to implementation more quickly. Institutional planning was important for all measures – not just for who would be responsible for carrying out certain activities but also for making sure that the measures would be taken care of and sustained in the long run. Stakeholder involvement was a hallmark of the C-LIEGE pilot measures and mostly took place in special round table meetings that brought together public and private stakeholders. Freight quality partnerships already existed in two pilot cities but needed to be formed in the other cities. Political and administrative decision-making processes were very important but also unpredictable. Political conditions changed in some pilot cities due to fresh local elections. Political leaders and institutions also had to weigh freight transport concerns vis-à-vis other (partly competing) political interests and projects. As a result these processes were often longer than

anticipated or resulted in a slower and more cautious implementation approach. Regulatory approval processes were even more unpredictable and in some cases resulted in stopping, delaying or significantly modifying the implementation of pilot measures. The technical and institutional implementation of the measures obviously differed a lot owing to the wide range of measures. The operation, maintenance and long-term sustainability of most C-LIEGE measures are still matters of the future. They are nevertheless very important for the overall success of the measures because soft measures are usually not 'fixed', one-time solutions but require regular updating in order for them to remain useful and meaningful for freight operators and drivers. This is especially the case for the purely institutional measures such as the freight quality partnerships and city logistics management, which were created, reactivated or further developed within the C-LIEGE project.

4.2. Summary of success factors

Based on the pilot measure experiences the report distilled several factors that are key to the success of soft urban freight transport measures. These were explained in section 3.3 of this report. In the following they are further summarised in the form of concise recommendations.

Institutional success factors

Local embedding of new measures and functions

A thorough assessment of existing institutions' functions, strengths, weaknesses and potentials needs to be conducted in order to determine if and where a new measure could best be embedded institutionally – or whether a new institution (like a freight quality partnership) needs to be created. Local embedding is crucial for soft urban freight transport measures because they are often new and innovative and have a pronounced institutional component.

Clarifying linkages between key institutions and tools

The linkages between existing and new institutions and tools of soft urban freight measures need to be identified, clarified and possibly redefined. This regards especially the relations between freight development plans, freight quality partnerships and city logistics managers. The success of soft measure oriented institutions and tools depend to a large degree on the fact *if* (and not so much how) these linkages have been addressed.

Early involvement of political and regulatory actors

In order to avoid rejections and delays stemming from political and regulatory institutions and decision-making processes it is suggested to invite and involve representatives from these institutions from early on. Thus reservations and stumbling blocks can be recognised and taken care of earlier. Furthermore, learning in both directions would be fostered, which is very important for novel solutions like the soft measures presented in this report.

Nested system of local and regional urban freight transport cooperation

C-LIEGE showed how important local cooperation of urban freight stakeholders is for successful soft measures. But freight transport is of course not only or primarily shaped by local factors. Therefore regional cooperation needs to be pursued, which builds on local cooperation efforts in the cities but also shapes and strengthens the right overarching conditions for local freight transport policies (like the example of Emilia-Romagna showed).

Comprehensive and issue-specific cooperation

Parallel, interrelated platforms for a) overall, comprehensive problems and solutions and b) for issue-specific purposes or even measure-specific purposes need to be established in order to have efficient communication processes that avoid overburdening local stake-holders. But this also calls for more coordination to shuffle up (or down) the issues and results of the various groups and cooperative institutions

Mentoring between cities

Mentoring relationships should be fostered between cities that are already experienced in a particular soft measure and those that are contemplating or starting to adopt it. Such mentoring encourages local initiators to move forward with a measure, provides a demonstrable example to convince other actors, provides benchmarks, proven procedures, templates and technical solutions that ensure efficient and effective implementation.

Strategic and technical success factors

Data and monitoring of freight traffic

Developing tailor-made solutions to urban freight transport requires comprehensive and up-to-date freight traffic data. Ideally freight traffic surveying and monitoring should be a continuous or at least regular activity that is coordinated either by the municipality, the city logistics manager or the freight quality partnerships.

Combining hard and soft measures

Soft measures and hard measures for improving local freight transport should not be seen as opposites or even competing. Hard measures, such as transport infrastructure investments, should go hand in hand with soft measures that support and valorise the hard measures. It needs to be ensured that both hard and soft measures are part of an overarching local transport policy, e.g. developed and implemented in the context of local freight development plans, freight quality partnerships or city logistics management.

Integration into commercial solutions

In order for certain innovative soft measures to have a greater effect it is necessary to move successful local innovations to supra-local and commercial levels. For example, innovative freight map solutions like the ones developed in Newcastle and Leicester should possibly be

integrated or coupled with commercial satellite navigation systems that freight operators and freight vehicle drivers already use.

Dissemination and marketing are crucial

Most soft urban freight transport measures require persuasion and voluntary participation of freight operators and vehicle drivers. Thus, in order to be effective and really make a large-scale impact it is crucial to spend considerable time, effort and hence also money on dissemination and 'marketing' of these essentially non-coercive and non-profit services.

Short-term piloting

In order to convince sceptical local stakeholders and show the effectiveness of soft measures it should be explored whether and how short-term pilots can be implemented. Through such pilots valuable experiences (and monitoring data) can be built up, doubtful actors be persuaded by demonstrated effects and opportunities for optimisation or compromise be identified.

Emphasising benefits to freight operators and freight vehicle drivers

Since most soft measures are based on persuasion and voluntary uptake it is crucial that freight operators and vehicle drivers can see real, tangible benefits from a measure, i.e. how it saves them time, stress and/or costs in their day to day operation. Such benefits to the end user should always be emphasised – even when other motivations, e.g. environmental concerns are in fact more important to the initiators of a measure or the public at large.

Engaging all public sector organisations

Besides focussing on private users (see above) it is important to engage all public sector organisations in taking up a particular freight transport soft measure. After all, the public sector is responsible for a significant share of the overall freight transport in a city. Soft measures can gain greater relevance and unfold greater effects if the public sector realises and uses its power as a significant freight market actor.

4.3. Guidelines for the transfer of soft measures

The results and success factors presented above clearly speak in favour of adopting freight transport soft measures in other cities than the ones involved in the C-LIEGE project. It has to be borne in mind, however, that each city constitutes a unique constellation of physical, environmental, economic, social and socio-political conditions. Thus, what is an effective freight transport measure in one city may well be a failure or completely inappropriate measure in another city. It is therefore not possible to declare or praise a particular measure as universally suitable for being transferred and applied in other cities.

A more appropriate approach is to specify the typical requirements that a particular freight transport measure has and what problems it addresses. On this basis decision-makers from other cities can better determine which measure would be most suited for their specific purposes and local conditions.

Based on these general remarks the following section seeks to provide a simple tool or guideline for making decisions about the transferability of measures to other local contexts. The tool is addressed to local decision-makers or 'consultants' in a broad sense who advise decision-makers in regard to choosing appropriate urban freight transport measure for solving particular local problems.

As a first step these decision-makers or their advisers need to conduct a rough self-assessment that determines (a) what urban freight transport problems are most pressing in their locality, (b) what positive changes they hope to bring about and (d) what resources – in a wider sense – their city has for implementing soft urban freight measures, including resources like political will, financial means and available time. This self-assessment should ideally be conducted jointly with key freight transport stakeholders so that it truly reflects the goals and implementation conditions that a new measure should address.

Equipped with this self-assessment the decision-makers can then consult the following two tables that list and characterises the urban freight transport measures that were tested and evaluated by the C-LIEGE project.

Urban freight transport measure	Potential impacts: Freight traffic	Environmental	Operating costs	Impacted area
Loading/Unloading bays	m	l/m	l	L
Access fees incl. time windows	m	h	m	L
Relocation of pack stations	l/m	l/m	l/m	L
Regional harmonization of UFT regulations	m	m	l/m	L/C/R
Low emission zone (combined with lorry lanes)	h	h	h	C
Signage to industrial estates	l/m	l	l	L
Freight map (online and/or on smart phone)	m/h	m/h	m	C
Re-routing of freight traffic	m	l	l	L
Traffic announcements & routing recommendations	m/h	m/h	m	C/R
Intelligent Traffic System for bridge traffic	m	m	l/m	L
Optimal location of lorry petrol station	h	h	h	L
Sharing of electric vehicles	l	l	l	L/C
Fleet Operator Recognition Scheme	l/m	l/m	l/m	C/R
Promotion campaigns for sustainable urban freight transport (incl. eco-driving)	l/m	l/m	l	C/R
City Logistics Manager	m	m	m	C/R
Freight Quality Partnership	m/h	m/h	m	C/R
Local Freight Development Plan				C/R

R	Regional
C	City
L	Local

high
med-high
medium
low-med
low

Table 6: Overview of potential impacts of urban freight transport soft measures

Table 6 addresses the potential impacts of the listed soft urban freight transport measures. This is a further summarised version of the more specific impacts overviews presented in Chapter 2. Impacts were categorised in regard to their effects on (a) freight traffic, (b) the environment and (c) operating costs of freight operators. A fourth category regards the spatial level that the measure and its impacts primarily relate to. For each measure it was assessed whether impacts in these categories were low, medium or high – or in between these classes.

Urban freight transport measure	Implementation requirements				
	Political/ administrative	Financial	Technical	Institutional	Time
Loading/Unloading bays	m	l	l	l	l
Access fees incl. time windows	m/h	l	l	m	m
Relocation of pack stations	l	l	l	m	l
Regional harmonization of UFT regulations	h	l	m/h	h	m/h
Low emission zone (combined with lorry lanes)	h	m/h	m	m/h	m/h
Signage to industrial estates	l	l	l	l	l
Freight map (online and/or on smart phone)	l	m/h	m/h	l/m	m
Re-routing of freight traffic	h	l	l/m	m	m
Traffic announcements & routing recommendations	l	h	h	m/h	m/h
Intelligent Traffic System for bridge traffic	l	h	h	m	m
Optimal location of lorry petrol station	m/h	l	l	m	m
Sharing of electric vehicles	m	m/h	m	m	m
Fleet Operator Recognition Scheme	m/h	m/h	l	m/h	m/h
Promotion campaigns for sustainable urban freight transport (incl. eco-driving)	l/m	l/m	l	m	m
City Logistics Manager	m/h	m	m	m/h	h
Freight Quality Partnership	m/h	m	m	m/h	h
Local Freight Development Plan	h	m	m/h	m/h	m/h

l	low
l/m	low/medium
m	medium
m/h	medium/high
h	high

Table 7: Implementation requirements of urban freight transport soft measures

In Table 7 the measures are categorised in regard to their implementation requirements. These requirements are differentiated into (a) political and administrative, (b) financial, (c) technical, (d) institutional and (e) time aspects.

Decision-makers can now take their self-assessment and use it for choosing the most suitable measures. They would first identify measures on the basis of which potential impacts would best address their own goals or solve their freight transport problems. Afterwards they would focus on these most suitable measures and match the respective implementation requirements with the resources and conditions in their own city.

As a fourth step they can then consult the summary descriptions and evaluation results of the chosen measures that are presented in this report and other deliverables of the C-LIEGE project. In this way they would be able to learn more about the real world implementation and corresponding challenges, successes and opportunities.

This four-step approach thus leads a decision-maker or adviser from taking a guided look at his needs and resources to systematically choosing one or a few soft measures. This ‘best match’ of measures could finally be double-checked with real examples that were implemented in the C-LIEGE pilot cities.

5. References

Bonnafous, Alain; Gonzalez-Feliu, Jesus; Routhier, Jean-Louis (2013): An Alternative UGM Paradigm to O-D Matrices: The Freturb Model. In: Proceedings of WCTR 2013 Rio de Janeiro.

European Environment Agency (2013): Road user charges for heavy goods vehicles – Tables with external costs of air pollution. EEA Technical Report 1/2013.

Road Hauling Association (2013): RHA Cost Tables 2013. Prepared by DFF International

Routhier, Jean-Louis; Patier, Danièle; Aubert, Pierre-Louis (1996): An attempt at modelisation of goods transport in urban area. COST 321 report, Brussels