

Measure title: **Efficient Goods Distribution**

City: **Donostia–San Sebastián** *Project:* **ARCHIMEDES** *Measure number:* **65**

Executive Summary

This measure is directed to improve the efficiency in freight distribution in the CIVITAS-Area in order to reduce the number of commercial vehicles travelling within the central retail and business area of Donostia-San Sebastián.

Following the recommendations of a feasibility study, an implementation plan was developed including these measures:

- Creation of a freight consolidation centre for the last mile distribution of goods
- The use of clean vehicles for last mile distribution
- Regulatory options to improve loading behaviour
- Increased control in the use of loading bays
- Design of a night distribution protocol
- The use of new technologies to make easier the communication between the distributors and the local shops, including communication with the municipal police and the possibility of reserving loading and un-loading zones.

The implementation of this measure has contributed to increase efficiency in urban goods distribution in two Donostia - San Sebastián highly populated neighbourhoods. On the one hand, the new goods delivery regulation in the CIVITAS-Area has contributed to a reduction in the average journey length from delivery vehicles from 4,5 km to 4,1 km. While the new last mile delivery service with electric cargo-bikes has saved up to 26.849,4 km per year.

As a consequence, a yearly reduction of 23% in energy consumption has been achieved, in addition to a significant reduction of carbon and pollutant emission levels associated to the delivery of goods within the CIVITAS-Area. And the transport companies have reduced more than 6.800 € per year their operation costs due to the implementation of the measure.

Regarding society indicators, the survey conducted reveal that nearly half (48,5%) of the involved population (neighbours, shopkeepers and transport operators) are aware of the initiatives put in place in the framework of the CIVITAS measure. More efforts on information regarding the measure are recommended, especially among neighbourhoods, although the new regulation affects them to a less extent than carriers and shopkeepers.

As for the acceptance level, the overall measure is assessed with an average score of 4,87 out of 10. This score contrast with the significantly higher score given to the different actions if assessed separately, which evidences the complexity of goods delivery, where many stakeholders are involved and not all measures are well perceived by everyone.

This highlights the importance of on-going communication with stakeholders, and its involvement in the definition of the measures to be implemented. A wide consensus regarding the need for action and the way to articulate it guarantees the acceptance of the measure and paves the way for further developments. A Freight Quality Partnership is seen as an ideal tool for this, although it could not be achieved in this case. Bilateral meetings with stakeholders were held in order to overcome the lack of engagement with the FQP.

Cooperation with innovative companies, able to guide other through the implementation of innovative solution is also recommended as a success factor in the implementation of this kind of measures.

A Introduction

A1 Objectives and target groups

A1.1 Objectives

The measure objectives are:

(A) High level / longer term:

- To minimise the environmental impact of transport in the city centre.

(B) Strategic level:

- To increase the efficiency of goods distribution transport in the city centre in order to reduce the number of commercial vehicles travelling within the central retail and business area of Donostia-San Sebastián.

(C) Measure level:

1. To create a strong stakeholders group in order to discuss and find solution for goods distribution issues
2. To improve loading and unloading regulation and facilities
3. To increase the use of clean vehicles in goods distribution traffic

A1.2 Target groups

The main target group is all stakeholders involved in good distribution activity. This includes shopkeepers and transport companies, as well as representatives from the Shopkeeper associations, representatives from the transport sector (Federación Mercantil, Dendass, and the hauler association Guitrans), the municipal police and the mobility department from the municipality of Donostia - San Sebastián(ADS).

Also people living in the city centre are targeted since improved air quality and lower emissions in the area have influence them in a positive way.

A2 Description

The city of Donostia - San Sebastián, which concentrates intense commercial and social activity in its centre, is surrounded by numerous industrial areas generating a significant flow of goods and vehicles towards the centre of the city every day. The CIVITAS-Area defined for this measure (an area of 0.75 km² covering the inner city centre of Donostia-San Sebastián, including the Old Quarter) attracts 73% -81,939 vehicles per working day- of the traffic that enters Donostia through its outer belt).



Picture 1.- CIVITAS-Area

Like most of the historic urban centres, the CIVITAS-Area was not planned to bear the current intensity of traffic, being essential to implement measures aimed at encouraging a more sustainable mobility, including freight transport.

From a logistical point of view, although goods delivery in the entire CIVITAS-Area is very difficult, two perfectly differentiated areas can be identified: on the one hand the Old Quarter and on the other the Centro neighbourhood.



Pic. 2.- Old Quarter and Centro Neighbourhood

- The **Old Quarter** is a pedestrian area, characterised by narrow streets with limited space for loading and unloading of merchandise, which is governed by special regulations, including an access restriction scheme that complicates goods delivery. The major presence of establishments from the catering/restaurants sector (31%), which generally require daily supplies, linked to the complete absence of loading bays along its perimeter, resulted in a hazardous occupation of pedestrian areas during the established delivery hours (from 7:00 to 11:30 am), since carriers have to finish their operation as quickly as possible.

Another issue to be borne in mind is the opening times of the catering sector establishments, which in many cases begin at 11:00 am or even later, meaning that deliverers have to adapt to these times, generating a great concentration of delivery vehicles in a short period of time.

Also, with regard to the space devoted to loading bays, the former 0,2 metres per commercial outlet was far from the 1 loading space per 8 establishments ratio considered as the minimum standard.

- **Centro Neighbourhood** is an area characterized by tertiary services, with a strong presence of commercial outlets in the textile industry (28%) which call for periodical and seasonal supply. The gradual pedestrianization of an area which formerly accounted for very high traffic levels has generated specific problems for goods delivery, since these pedestrian-friendly streets have now restricted access hours (from 8:00 to 11:00 am), and distances between commercial outlets and loading bays have increased, which consequently made longer stay in these zones and decreasing rotation rates.

The ratio of load space in this area is 0.7 metres per establishment, a more suitable proportion than in the Old Quarter. In any case, more efforts regarding its control, aiming to guarantee that loading spaces really fulfil their function, were required.

The situation in these two areas claimed for a rearrangement of logistic activity in order to rationalize goods delivery and increase efficiency, while reducing impacts and promoting the minimum possible use of public space.

In this context, this measure is directed to improve the efficiency in freight distribution in the CIVITAS-Area in order to reduce the number of commercial vehicles travelling within the central retail and business area of Donostia-San Sebastián.

As a first step, the project has undertaken a feasibility study in order to better understand all dimensions of goods distribution activity and identify the measures and recommendations to be adopted. In order to do so, all stakeholders have been approached to evaluate their willingness to take part in a Freight Quality Partnership (FQP) whose main task would be to monitor and contribute to the feasibility phase by discussing on possible solutions to identified issues. Unfortunately, the lack of willingness to take part on it forced the cancellation of the FQP initiative. Bilateral meetings with stakeholders were held in order to overcome this unexpected lack of engagement.

Following the development of the feasibility study, an implementation plan including all the selected measures and recommendations was adopted. The main options investigated and discussed during the design phase were:

- Creation of a freight consolidation centre for the last mile distribution of goods
- The use of clean vehicles for last mile distribution

- Regulatory options to improve loading behaviour
- Increased control in the use of loading bays
- Design of a night distribution protocol
- The use of new technologies to make easier the communication between the distributors and the local shops, including communication with the municipal police and the possibility of reserving loading and un-loading zones.

To avoid legal and social barriers, a group of debate and control have been created with the Chamber of Trade, retailer's associations, resident's associations, representatives of the transport industry, local police, and other agents involved in freight distribution

The scheme has been supported by a communication campaign focused on the trade sector.

Also within this measure, IVL (Basque Logistics Institute, main partner of the municipality of Donostia - San Sebastián in the development of the measure) has celebrated a seminar on urban goods distribution in the city of San Sebastian. This forum served as an exchange arena for different successful experiences within the CIVITAS framework as well as others selected for their excellence.

B Measure implementation

B1 Innovative aspects

The innovative aspects of the measure are:

- **Use of new technology/ITS** (at national level) – 4 CCTV cameras have been installed in the Old Quarter in order to effectively control the observance of allowed delivery times in this area.
- **New mode of transport exploited (at national level)**-. Clean electric cargo-bikes are being used for goods delivery. The vehicles used for delivering have a huge load capacity of 1500 litres and 180 kg. Assisted pedalling is used to get the bikes in motion, therefore it is really comfortable for the driver requiring minimal effort.
- **New physical infrastructure solutions (at national level)**-. The use of electric cargo-bikes has been complemented by the implementation of a Freight Consolidation Centre in the surroundings of the historic city centre.

B2 Research and Technology Development

Under the coordination of IVL, a feasibility study has been undertaken. IVL was supported by the municipality (ADS) and a subcontractor from the freight sector. In preparation for the demonstration phase, an inventory of the volumes of goods and number of freight trips made in the central areas was undertaken. Possible legal barriers to the implementation were also investigated.

The main options investigated and discussed during the design phase were:

- Creation of a freight consolidation centre for the last mile distribution of goods
- The use of clean vehicles for last mile distribution
- Regulatory options to improve loading behaviour
- Increased control in the use of loading bays
- Design of a night distribution protocol
- The use of new technologies to make easier the communication between the distributors and the local shops, including communication with the municipal police and the possibility of reserving loading and un-loading zones.

The conclusion from the design phase and recommendations for the demonstration and monitoring were included in the study of consolidation possibilities issued in Month 18 (Milestone 11.7.2).

B3 Situation before CIVITAS

Before the CIVITAS project, there were a total of 1,464 establishments in the CIVITAS area of Donostia-San Sebastián: 457 in Parte Vieja (the Old Quarter) and 989 in Centro neighbourhood. Within this zone, there were a total of 44 loading bays: 6 in Parte Vieja and 38 in the City Centre. This provides 835 metres of kerbside available for loading, with different application times linked to the commercial activity. But these areas were very often occupied by illegally parked cars, making goods delivery more difficult in an already complex area.

With regard to merchandise deliveries, 26.8% of the establishments received merchandise every day, 1.9% 3 or more times a week, 29.9% less than 3 times a week, and the majority, 35.5% received the merchandise seasonally: 7.2% monthly, 1.5% every two months and 26.8% every quarter.

Also, there were no co-ordinated action plan and management amongst the various stakeholders for goods distribution. The freight distribution was not very efficient and also became a problem in the managing of the public space

B4 Actual implementation of the measure

The measure was implemented according to the following stages:

Stage 1: Stakeholders involvement, (From month 2 to month 44)

IVL approached all relevant stakeholders in order to assess the viability of a Freight Quality Partnership, a stakeholder group that would include representatives from the city and the sector. Unfortunately, the lack of willingness to take part on it forced the cancellation of the FQP initiative. Bilateral meetings with stakeholders were held in order to overcome this lack of engagement.

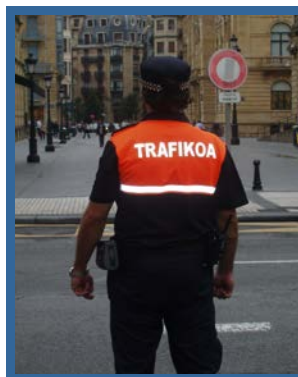
Stage 2: Study of consolidation possibilities (From month 2 to month 18)

In order to prepare the demonstration task, an inventory of the volumes of goods and number of freight trips made in the central areas was undertaken. Possible legal barriers to the implementation were also investigated.

Stage 3: Implementation, (From month 1 to month 44)

ADS and IVL gradually implemented the agreed solutions:

- Mobility Agents: As a first step in the implementation of the measure, prior to the development of the consolidation possibilities study, the number of mobility agents, among others, responsible for the adequate use of loading and unloading bays, was increased with 60 new agents. (September 2008).



Picture 3.- Mobility agent in Donostia-San Sebastián

- Consolidation centre: A 450 m² warehouse owned by the City Council, located in the surroundings of the CIVITAS area (Duque de Mandas Street in the Egia district) started to be used as consolidation centre for the reception of goods in bulk and their posterior delivery by totally ecological vehicles (electric bicycles). The urban distribution centre is operated by a delivery company by means of a collaboration agreement. It should be noted that not all goods deliveries within the CIVITAS Area make use of the consolidation centre, therefore not delivered by ecological vehicles. But the increasing

share of goods distributed from the consolidation centre is all delivered by means of electric bicycles (June 2010).



Picture 4.- Urban consolidation centre in Donostia-San Sebastián

- Clean distribution vehicles: San Sebastian city council and the Basque Logistics Institute have signed a cooperation agreement with the Labour Limited Company “Txita Txirrindak” in order to operate urban distribution services using fully ecological vehicles (bicycles). The use of clean delivery vehicles is associated to the consolidation centre described above. The vehicles used have a large load volume capacity, 1500 litres, and can carry up to 180 kg. Currently there are 6 electric cargo bicycles operating in the CIVITAS Area. In 2011 the total amount of goods delivered by electric bicycles was 270.798,5 kg, a relatively small but significant share of all urban goods delivery within the CIVITAS Area, which is steadily increasing. (June 2010).



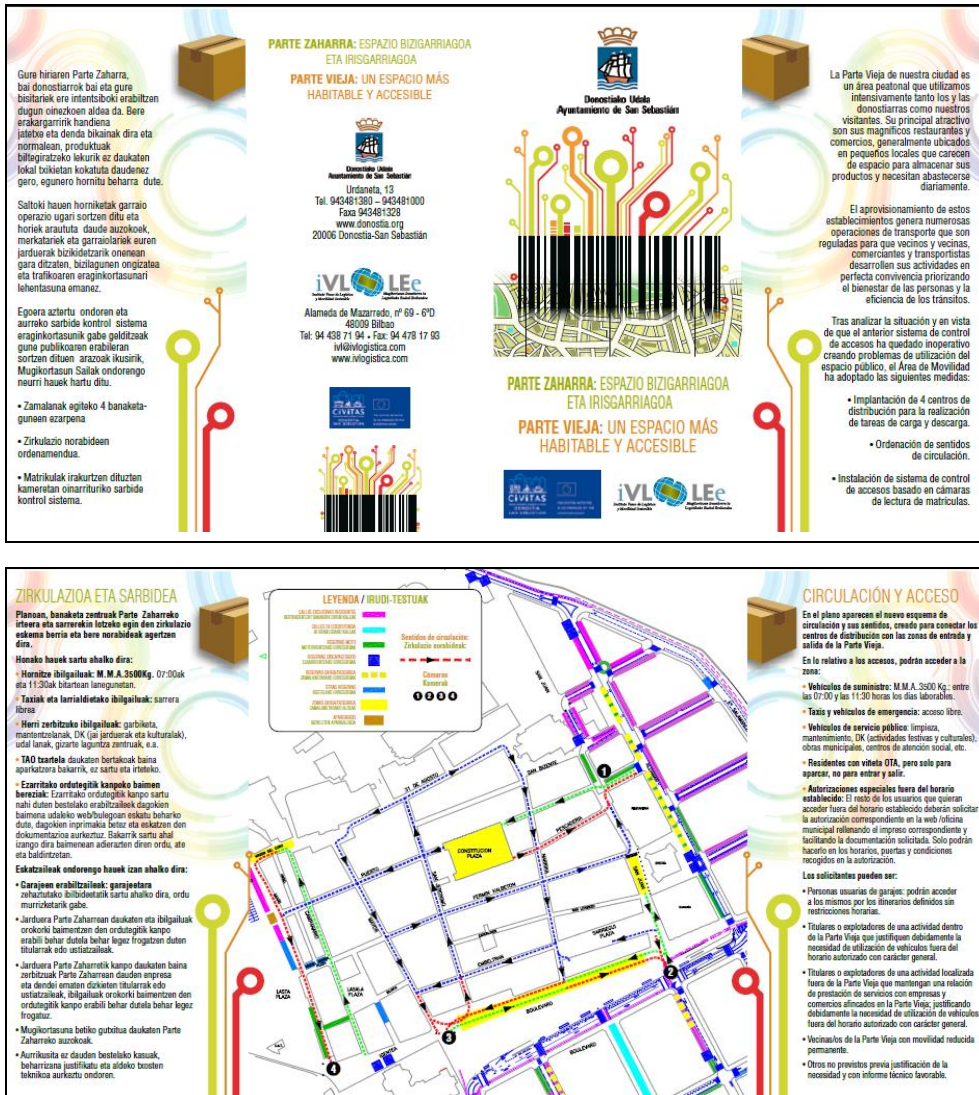
Picture 4.- Clean distribution vehicles in Donostia-San Sebastián

- Improved loading behaviour and better use of loading bays: in order to increase efficiency in delivery operations, a clearer distribution of traffic flows in the old quarter has been produced, accompanied by improved signposting and enforcing compliance with it. Four cameras have been installed in the access streets of the old quarter to ensure that these streets are left clear after delivery times. Also, a review and update of the loading and unloading timetable has been undertaken, unifying all available possibilities into four single time slots for the various areas and depending on the needs of each area. The changes were made public by horizontal and vertical signposting and information. It was also published in press articles, as well as in IVL’s and City Hall’s website, magazine and related media. Finally, the number of mobility agents controlling illegal parking in loading bays has been increased. (June 2012).

- **Night distribution:** San Sebastian city council and the Basque Logistics Institute have developed a "night-time unloading" procedure has been developed for the city. Two time slots: from 07:00 to 8:00 AM and/or from 21:00 to 22:00 PM. This protocol is already fully developed, although its application is based on a voluntary basis.

Stage 4: Promotional activities, (Month 38 onwards)

IVL have organised promotional activities for the new goods distribution scheme to inform the transport sector about the approach.



Picture 5.- Efficient goods distribution information brochure

Additionally, neighbours and retailers have been mailed two times along the measure implementation in order to get them informed about the main changes in good deliveries regulation.

Also, the measure developments have been widely echoed by local and regional media (newspapers, television, radio, websites,...).

- <http://www.youtube.com/user/TXITRANS>
- http://www.eltis.org/index.php?ID1=7&id=61&video_id=60
- <http://www.youtube.com/watch?v=aOY2hWlYLl4&feature=related>

http://www.youtube.com/watch?v=qGInM5M1zqc&playnext=1&list=PL9FB58D056E617B49&feature=results_main

Stage 5: Evaluation, (From month 18 to month 48)

Evaluation tasks have been carried out according to the MLEP.

B5 Inter-relationships with other measures

The measure is related to “Changing parking behavior” (DSS 23) or High Quality Bus Corridor (DSS16) because the goods distribution has to share the scarce space at the city centre with public transport and private cars.

C Planning of Impact evaluation

C1 Measurement methodology

C1.1 Impacts and indicators

C1.1.0 Scope of the impact

This measure has contributed to increase efficiency in urban goods distribution in two Donostia - San Sebastián highly populated neighbourhoods, reducing both the number of trips and vehicle emissions per tonnage distributed. Positive impacts in terms of better air quality and improved quality of life are also derived from this measure.

From the shopkeeper's perspective, the measure is having an impact on the economic performance of the distribution activity, since more efficient way to undertake this activity has been deployed.

C1.1.1 Selection of indicators

NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
ECONOMY						
2a		Costs	Costs	Capital costs	Capital cost per system or unit	Euros, quantitative
2b				Operating costs	Costs per pkm or vkm	Euros/pkm or Euros/vkm, quantitative, derived or measured
ENERGY						
		Energy Consumption	Fuel Consumption	Energy consumption of freight distribution	Energy consumption savings derived from increased efficiency in good distribution in demonstration area	MJ
ENVIRONMENT						
8		Pollution/Nuisance	Emissions	CO ₂ emissions	CO ₂ emission savings derived from increased efficiency in good distribution in demonstration area	ton
9				CO emissions	CO emission savings derived from increased efficiency in good distribution in demonstration area	ton
10				NOx emissions	NOx emission savings derived from increased efficiency in good distribution in demonstration area	ton
11				PM emissions	PM ₁₀ and/or PM _{2.5} emission savings derived from increased efficiency in good distribution in demonstration area	ton
SOCIETY						
13		Acceptance	Awareness	Awareness level	Awareness of the measure by transport companies, shopkeepers and citizens.	Index (%),
14			Acceptance	Acceptance level	Attitude survey of current acceptance of the measure by the shopkeepers	Index (%),
TRANSPORT						
25		Transport System	Freight Movements	Goods vehicles moving in demo areas	Yearly number of good veh-km and ton-km	Veh-km y ton-km
			Parking offences	Parking offences	Number of vehicles illegally parked in loading bays	Nº, quantitative

C1.1.2 Methods for evaluation of indicators

No.	INDICATOR	TARGET VALUE	Source of data and methods	Frequency of Data Collection
2a	Capital costs	Not defined	Expenses in studies, promotional campaigns, new technologies, complementary infrastructure, etc.	When implementation or purchase takes place
2b	Maintenance Costs	Not defined	Financial accounts from ADS with costs related to infrastructure and technical devices maintenance.	Annual
	Fuel Consumption	Not defined	Fuel consumption savings have been estimated based on the volume and mileage of goods shifted from conventional to clean vehicles, as well as on improved operation delivery services.	Two times, before and after the implementation of the measure
8-9-10-11	CO ₂ , NO _x , PM, CO emissions	Not defined	Emission savings have been estimated by the application of an emission-factor-based methodology to the volume and mileage of goods shifted from conventional to clean vehicles (Txitrans records have been used for this purpose), as well as on improved operation delivery services (resulting in a fewer number of vehicles operating in the Old Quarter).	Two times, before and after the implementation of the measure
13-14	Attitude survey	Not defined	A specific survey has been conducted among transport operators, shopkeepers and users/citizens. A representative sample of each category has been selected (20 transport companies, 200 shopkeepers and 50 users/citizens). For shopkeepers and transport operators a first round of personal interviews has been complemented by telephone and on-line questionnaires. For users/citizens, a random generated database of 300 home addresses has been used in order to complete 50 telephonic questionnaires.	One time after the implementation of the measure
25	Number of freight vehicle-kilometres in the city centre	Not defined	Data has been collected through specific field work. Freight vehicles operating in the Old Quarter of the city have been manually accounted for 30 minutes during 6 days for each data collection period at the main access streets of the Old Quarter (Boulevard, Garibai, Hondarribia, Urbietta, Idiáquez, Bengoechea, Oquendo, Hernani, Easo, Moraza, Arrasate, Urdaneta, San Bartolomé, Peñafiorida, Andía, Prim, Triunfo y Aldamar).	Two times (before and after situation)
	Parking offences	Not defined	Police records on the Number of vehicles illegally parked in loading bays	Two times (before and after situation)

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C1.1.3 Planning of before and after data collection

EVALUATION TASK	INDICATORS INVOLVED	COMPLETED (DATE)	BY	RESPONSIBLE ORGANISATION AND PERSON
Economic indicators	2a-2b	Month 30 onwards		IVL Iratxe García
Freight volume and mileage	8-9-10-11	Month 24 - 36		IVL Iratxe García
Attitude survey	13-14	Month 36		IVL Iratxe García
Vehicle counts	25	Months 18 -36		IVL Iratxe García
Parking offences	-	Months 18 -36		IVL Iratxe García

C1.2 Establishing a baseline

To evaluate the impact of this measure a twofold approach has been followed. On the one hand, the perception of citizens and stakeholders about the changes in goods delivery has been assessed (awareness and acceptance of the measure). On the other hand, actual performance data has been analysed (heavy and light duty vehicles movements within the CIVITAS-Areas, improved efficiency, energy and emission savings, etc.).

The first group of indicators was gathered through a specific survey among transport operators, shopkeepers and users/citizens after the implementation of the measure. A representative sample of each category has been selected (20 transport companies, 200 shopkeepers and 50 users/citizens). For shopkeepers and transport operators a first round of personal interviews has been complemented by telephone and on-line questionnaires. For users/citizens, a random generated database of 300 home addresses has been used in order to complete 50 telephonic questionnaires. The survey was conducted along May/June 2012.

For the second group of indicators data has been collected through specific field work. Before the measure was implemented, in October 2008, freight vehicles operating in the Old Quarter of the city were manually accounted for 30 minutes during 6 days for each data collection period at the main access streets of the Old Quarter (Boulevard, Garibai, Hondarribia, Urbietta, Idiáquez, Bengoechea, Oquendo, Hernani, Easo, Moraza, Arrasate, Urdaneta, San Bartolomé, Peñafiorida, Andía, Prim, Triunfo y Aldamar). In order to be able to estimate energy efficiency and emissions indicators, this information was complemented with data collection from the transport operators regarding fleet composition and mileage. This data collection campaign was repeated once that the measure was fully implemented, in October 2012.

Data provided by the local police (department responsible for this matter) regarding parking offences in loading and unloading bays has also been used.

Energy efficiency have been estimated based on the volume and mileage of goods shifted from conventional to clean vehicles, as well as on improved operation delivery services. For emission savings, an emission-factor-based methodology has been applied to the volume and mileage of goods shifted from conventional to clean vehicles (Txitrans records have been used for this purpose), as well as on improved operation delivery services (resulting in a fewer number of vehicles operating in the Old Quarter).

Finally, the economic dimension of the measure has been assessed. Investment and operation and maintenance costs associated to the implemented actions have been addressed. Also the operating savings (namely, fuel costs savings) associated to increased efficiency in goods delivery operation has been assessed.

C1.3 Building the Business-as-Usual scenario

If this measure would not be implemented, loading ratios on good distribution vehicles would follow the tendency showed in previous years. Accordingly pollutant and carbon emissions, as well as noise levels, would follow the same patterns.

For evaluation purposes, performance and environmental indicators associated to the BaU scenario have been estimated based on the evolution in freight vehicles traffic accounted

during the previous years before the CIVITAS project started. According to the records of registered heavy and light duty vehicles in Donostia-San Sebastian, the number of distribution vehicles in the city was experiencing a decreasing pattern of 2,95% per year.

For social indicators, before the CIVITAS project there were not regular survey programme regarding goods delivery operations. Therefore is not possible to estimate BaU indicators, due to the lack of historic reference data.

Indicador	Before (2008)	BaU (date)	After (2012)	Difference: After –Before	Difference: After – BaU
2a. Capital costs	0	N/A	296.102€		N/A
2b. Operating costs	0	N/A	97.074€	97.074€/year	N/A

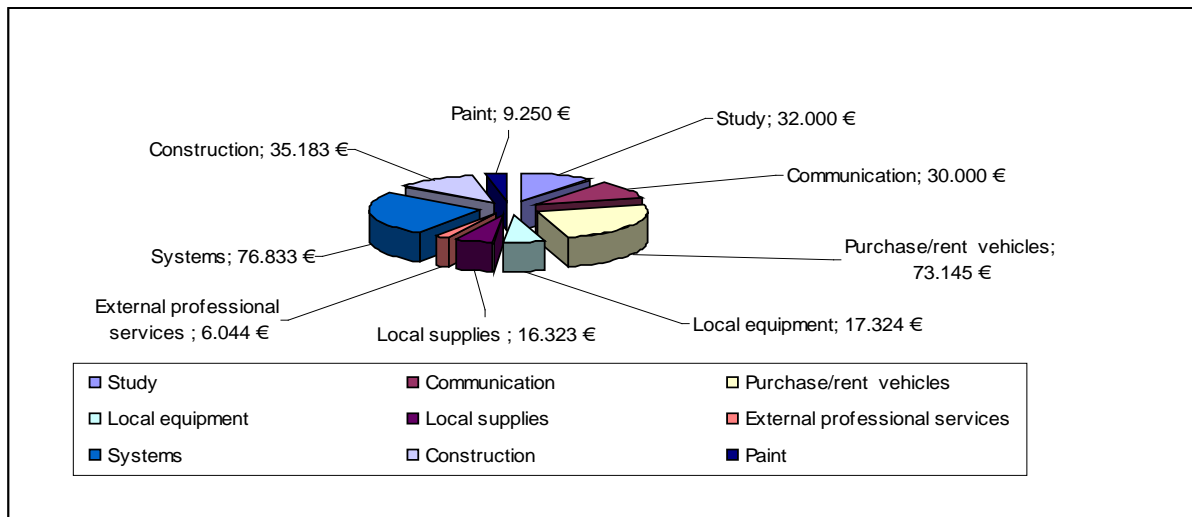
C2 Measure results

C2.1 Economy

First of all, the costs associated to the measure implementation are addressed:

Table C2.1.1: Costs (measure implementation)

Capital costs include all the investment required for the implementation of the foreseen actions (consolidation centre, clean delivery vehicles, enhanced signalization, control CCTV cameras, etc.). The following graph provides detailed information on these costs:



Graph 1.- Detailed investment costs

As it can be seen in the graph above, technical devices and systems account for the largest investment cost, followed by the purchase/rent of the cargo-bikes.

In addition to these investment costs, an annual amount of 97.074€s required to conduct maintenance costs, mostly associated to the consolidation centre.

But the implementation of the measure has led to an improved efficiency in goods delivery distribution, namely the reduction in the mileage from heavy and light duty vehicles

during delivery operations. This has resulted in reduced operating costs for cargo companies, driven by the reduction in fuel consumption.

Table C2.1.1: Costs (transport operators)

Indicator	Before (2008)	BaU (2012)	After (2012)	Difference: After – Before	Difference: After – BaU
2b. Operating costs	32.198,34 €year	33.128,109 €year	26.249,02 €year	-5.949,32 €year	-6.879,08 €year

The estimations are made based on the data given by the transport operators in the CIVITAS-Area. According to it, vehicles in the CIVITAS zone are divided in two kinds of goods delivery vehicles:

- 3500 kg trucks: 25 % of the total vehicles
- 2500 kg vehicles (conventional vans): 75% of the total vehicles

The average number of vehicles that enter to the CIVITAS zone is calculated as follows:

According to data collection, an average of 143 vehicles enters to the “*Plaza de la Constitución*” square, which represents an 80% of all vehicles entering the CIVITAS-Area, according to the survey. Therefore it could be inferred that the number of vehicles that enter to the CIVITAS zone is 178 vehicles per day, distributed as follows:

- 3500 kg trucks (heavy duty vehicles): 44
- 2500 kg vans (light duty vehicles): 134

Before the measure was implemented, in 2008, the average trip length was 4,5 km. While in 2012 this length has been reduced to 4,1 km on average.

The average fuel consumption for each type of vehicle is:

- 3500 kg trucks: 12 l/100km
- 2500 kg vans: 10 l/100km

The reference price of the diesel fuel is

- 1,33 €/l in 2008
- 1,41 €/l in 2012.

The number of working days per year is: 288 working days per year.

In addition to the reduced mileage from heavy and light duty vehicles, it should be taken into account that the new Txitas service, based on estimations made by the operator company, saves up to 26.849,4 km per year (9.536 km corresponding to heavy trucks, while the remaining 17.313 km corresponds to vans).

For the BaU scenario it is considered that the efficiency patterns of 2008 remain in 2012 (i.e. the average trip length remains 4,5 km), but considering 2012 fuel price levels, as well as the evolution of the freight vehicle fleet (as explained above, a 2,95% decrease per year has been registered). Finally, The BaU scenario does not consider the implementation of the Txitas service (clean vehicle delivery).

According to this calculations, freight transport companies have saved more than 6.800 € per year due to the implementation of the measure.

C2.2 Energy

The energy consumption of freight distribution is calculated based on the above (fleet composition, average trip length and fuel consumption), taking into consideration:

- The actual density of the diesel fuels: 0,85 kg/l.
- The energetic balance of: 42,7 Mj/kg (diesel fuel)

For the BaU scenario it is considered that the efficiency patterns of 2008 remain in 2012 (i.e. the average trip length remains 4,5 km), but considering the evolution of the freight vehicle fleet (as explained above, a 2,95% decrease per year has been registered). The BaU scenario does not consider the implementation of the Txitas service (clean vehicle delivery).

Table C2.2.1: Energy Consumption

Indicator	Before (2008)	BaU (2012)	After (2012)	Difference: After –Before	Difference: After – BaU
Energy consumption of freight distribution	878.675,82 Mj/year	852.754,88 Mj/year	675.679,65 Mj/year	-202.996,17 Mj/year	-177.075,23 Mj/year

Since 2008, when the CIVITAS project started, energy consumption associated to goods delivery operations each year has decreased by a 23%.

C2.3 Environment

Emissions calculations are based on the fuel consumption calculations above.

The estimations are made using the European regulations of emissions as a reference. These regulations depend on the type of the vehicle, fleet age, the average consumption, and the type of fuel used.

The 100% of the surveyed vehicles are diesel powered.

In order to find out the average fleet age, an interview with two main freight companies was held. According to it, it is assumed the following average fleet age corresponding to the two types of vehicles operating in the CIVITAS -Area:

- 3500 kg trucks: 2004 (Euro 3)
- 2500 kg vans: 2005 (Euro 3)

According to this data, the emission factors used, as provided by the European regulation framework (Directive 98/69/EC and Directive 2001/27/EC), are:

Vehicle type	Emission factors			
	CO ₂ ((Kg/100km))	CO (g/100km)	NOx (g/100km)	PM (g/100km)
Heavy duty (diesel)	31,80	254,03	604,85	12,09
Light duty (diesel)	26,50	95,76	78,63	10,08

Table 1.- Emission factors

These emission factors have been estimated for the two kinds of vehicles (heavy and light duty vehicles) operating in the CIVITAS zone, according to a density of the diesel fuel of 0,85 kg/l and to a calorific capacity of 42,7 MJ/kg (= 11,86 kwh/kg), as well as their average consumption (12 and 10 l/100km, respectively).

For the BaU scenario it is considered that the efficiency patterns of 2008 remain in 2012 (i.e. the average trip length remains 4,5 km). Also regarding the engine technology, since no renewal of the fleet is considered associated to this scenario. The BaU scenario does not consider the implementation of the Txitas service (clean vehicle delivery).

Emissions are estimated as follows:

Table C2.3.1: Pollution and Nuisance

Indicator	Before (2008)	BaU (2012)	After (2012)	Difference: After –Before	Difference: After – BaU
8. CO₂ emissions	64,15 T/year	62,26 T/year	49,34 T/year	-14,80 T/year	-12,91 T/year
9. CO emissions	311,158 kg/year	301,97 kg/year	225,206 Kg/year	-85,95 Kg/year	-76,77 kg/year
10. NOx emissions	481,46 kg/year	467,25 kg/year	318,49 kg/year	-162,96 kg/year	-148,76 kg/year
11. Particulate emissions	24,39 kg/year	23,67 kg/year	18,76 kg/year	-5,63 kg/year	-4,91 kg/year

As it can be seen in the table above, the implementation of the measure has resulted in a significant reduction of carbon and pollutant emission levels associated to the delivery of goods within the CIVITAS-Area.

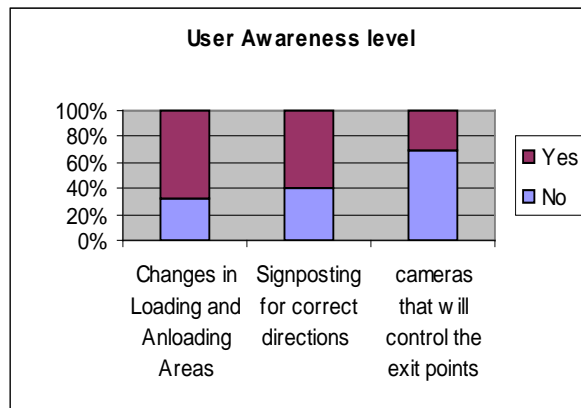
C2.4 Society

Regarding society indicators, the survey conducted reveal that nearly half of the involved population (neighbours, shopkeepers and transport operators) are aware of the initiatives put in place in the framework of the CIVITAS measure.

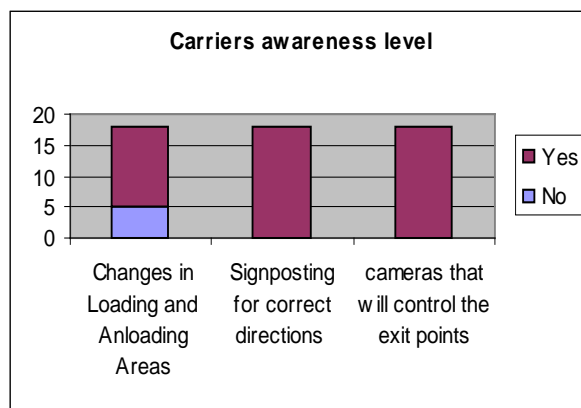
Table C2.4.1: Acceptance

Indicator	Before (2008)	BaU (date)	After (2012)	Difference: After –Before	Difference: After – BaU
13. Awareness level	N/A	N/A	48,5%	N/A	N/A
14. Acceptance level	N/A	N/A	3,90%	N/A	N/A

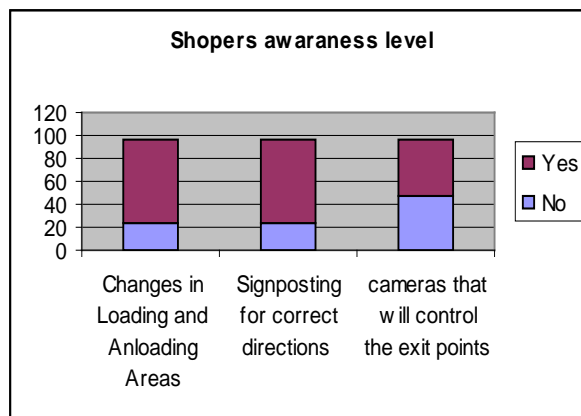
Following is a detailed assessment of awareness and acceptance level towards the main actions implemented by the different target groups:



Graph 2.- User awareness level

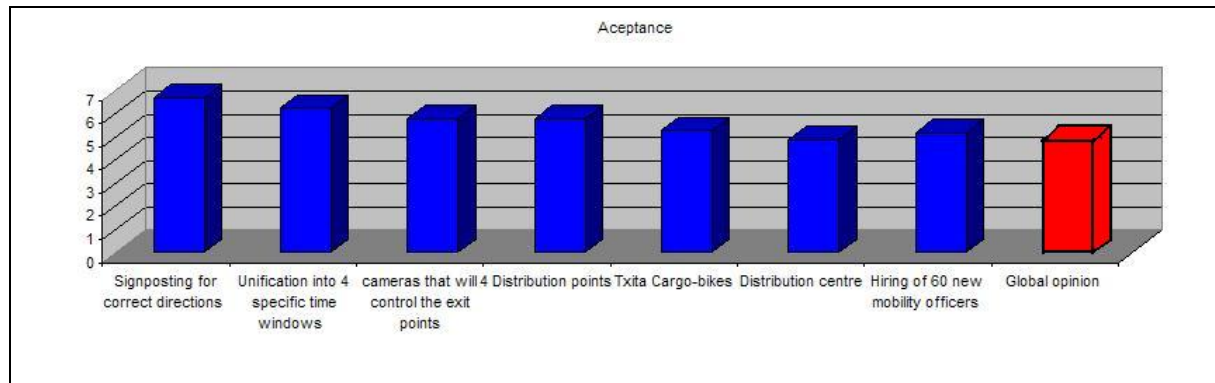


Graph 3.- Carriers awareness level



Graph 4.- Shopkeepers awareness level

As for the acceptance level, the overall measure is assessed with an average score of 4,87 out of 10. This score contrasts with the significantly higher score given to the different actions if assessed separately.



Graph 5.- Acceptance level

It should be highlighted that, according to the survey, 84% of the people living in the Old Quaterd believes that the overall situation regarding goods delivery has improved after the implementation of the CIVITAS measure.

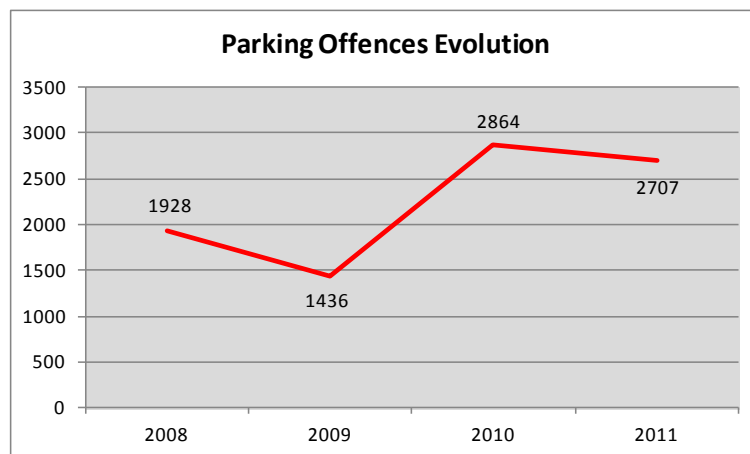
C2.5 Transport

Table C2.5.1: Transport System

Indicator	Before (2008)	BaU (2012)	After (2012)	Difference: After – Before	Difference: After – BaU
25. Goods vehicles moving in demo areas	230.688 v-km per year	223.860 v-km per year	203.961 v-km per year	-26.727 v-km per year	-19.899 v-km per year
Parking offences	1928		2707		

As already mentioned above, the implementation of the CIVITAS measure has prompted a significant reduction in the number of freight vehicles circulating in the CIVITAS-Area. This is the result of the improved operational conditions provided by the measure, as well as for the modal shift towards the use of clean delivery vehicles due to the operation of the Txitas (cargo-bikes) service.

Regarding parking offences, the increase in the number of mobility Agents, responsible for controlling the adequate use of loading and unloading bays, has resulted in an important increase in the number of parking offences associated to this activity.



Graph 6.- Parking offences evolution

In 2009 the number of offences decreased as compared with the previous year (due to the fact that the Mobility Agents followed an informative policy, given the implemented changes in the loading and unloading regulations). After this first stage, in 2010 the number of offences significantly increased. Although it should be highlighted that in 2011 (last year with data available) a decreasing trend has been initiated.

C3 Achievement of quantifiable targets and objectives

No.	Target	Rating
1	There are no quantitative targets associated to this measure.	
2		
3		
4		
NA = Not Assessed O = Not Achieved * = Substantially achieved (at least 50%) ** = Achieved in full *** = Exceeded		

C4 Upscaling of results

While the special characteristics of the old town make it difficult to up-scale the solutions implemented there to other parts of the city, the developments implemented in Centro-Ensanche (XIX century area) might be up-scaled to other neighbourhoods of the city of similar characteristics.

C5 Appraisal of evaluation approach

Overall, the evaluation approach is considered adequate.

C6 Summary of evaluation results

The implementation of this measure has contributed to increase efficiency in urban goods distribution in two Donostia - San Sebastián highly populated neighbourhoods. On the one hand, the new goods delivery regulation in the CIVITAS-Area has contributed to a reduction in the average journey length from delivery vehicles from 4,5 km to 4,1 km. While the new last mile delivery service with electric cargo-bikes has saved saves up to 26.849,4 km per year.

As a consequence, a yearly reduction of 23% in energy consumption has been achieved, in addition to a significant reduction of carbon and pollutant emission levels associated to the delivery of goods within the CIVITAS-Area. At the same time that the transport companies have reduced more than 6.800 € per year their operation costs due to the implementation of the measure.

Regarding society indicators, the survey conducted reveal that nearly half (48,5%) of the involved population (neighbours, shopkeepers and transport operators) are aware of the initiatives put in place in the framework of the CIVITAS measure. More efforts on information regarding the measure are recommended, especially among neighbourhoods, although the new regulation affects them to a less extent than carriers and shopkeepers.

As for the acceptance level, the overall measure is assessed with an average score of 4,87 out of 10. This score contrast with the significantly higher score given to the different actions if assessed separately, which evidences the complexity of goods delivery, where many stakeholders are involved and not all measures are well perceived by everyone.

C7 Future activities relating to the measure

The Municipality of Donostia-San Sebastián is considering the possibility of implementing a second urban consolidation centre in another area of the city. Possible locations and management structure will be assessed in the near future.

D Process Evaluation Findings

D0 Focused measure

X	0	No focussed measure
	1	Most important reason
	2	Second most important reason
	3	Third most important reason

D1 Deviations from the original plan

The deviations from the original plan comprised:

- **Freight Quality Partnership** – Due to the lack of willingness to take part on it, the FQP initiative was finally cancelled. Bilateral meetings with stakeholders were held in order to overcome the lack of engagement.
- **Use of ITS developments** – The “Study on consolidation possibilities” recommended the use of new technologies to make easier the communication between the distributors and the local shops, including communication with the municipal police and the possibility of reserving loading and un-loading zones. Although this possibility was initially contemplated, it was soon dismissed, due to its organizational complexity and technical difficulties.
- **Quality of Service** – The initial evaluation included the assessment of the perceived quality of service. This was finally omitted, due to the difficulties to find a common definition of Quality Service for users, carriers and shopkeepers. As well as it difficult differentiation from the actually assessed “Acceptance” level.

D2 Barriers and drivers

D2.1 Barriers

The main barriers encountered for the development of the measure are:

Preparation phase

- **Political / strategic barrier** – There were problems in the creation of the Freight Quality Partnership due to the different character and variety of interest of the involved stakeholders
- **Spatial barrier** – Due to the orographic characteristics of the city, one single consolidation centre is not sufficient in order to undertake last mile delivery through all the city making use of non-motorized modes

Implementation phase

- **Problem related barrier** – Not all local stakeholders share the need to make changes in the organisation of goods distribution.
- **Spatial barrier:** The physical characteristics of the Old Quarter, characterised by narrow streets with limited space for loading and unloading of merchandise, made it difficult to comply with the recommended 1 loading space per 8 establishments ratio considered as the minimum standard.

Operation phase

- **Positional barrier:** The gradual pedestrianization of the Centro neighbourhood, which formerly accounted for very high traffic levels has generated specific problems for goods delivery, since these pedestrian-friendly streets have now restricted access hours (from 8:00 to 11:00 am), and distances between commercial outlets and loading bays have increased, which consequently increased the length of stay in these zones, decreasing rotation rates in this areas.
- **Problem related barrier:** The opening times of the catering sector establishments place additional difficulties to an already complex situation. In many cases opening hours begin at 11:00 am or even later, meaning that deliverers have to adapt to these times, generating a great concentration of delivery vehicles in a short period of time.
- **Involvement/Communication:** Although information campaigns were undertaken, it takes some time to raise awareness among all shopkeepers and especially carrier operators about the new regulation for loading and unloading operations.

D2.2 Drivers

As for the drivers, the main ones affecting the measure are:

Preparation phase

- **Cultural driver** – Both, the growing concern regarding environmental issues and the increased costs of energy, are easing the way to implement energy efficiency measures in good distribution activities.
- **Political/Strategic driver** - There is a strong willingness from relevant companies to take part in pilot experiences in this matter, provided that they can increase the efficiency in their operation at the time that they use it as a marketing tool.

Implementation phase

- **Financial:** The availability of CIVITAS funding has been a significant opportunity to develop this measure.

Operation phase

- **Organizational:** The enlargement of the Mobility Agents staff has provided a better control of the appropriated use of loading and unloading bays.
- **Other:** The high level of public acceptance towards the new green vehicles used for urban delivery has played an important role in the development of the other assets of the measure.

D2.3 Activities

In order to handle the above referred barriers and/or to make use of the drivers, the following activities were taken during the implementation of the measure:

Preparation phase

- **Involvement/Communication:** Strong emphasis has been placed on awareness rising campaigns in order to highlight the advantages of sustainable mobility.
- **Planning:** Tools for the evaluation of performance efficiency in goods distribution have been developed in order to proof and communicate the benefits associated to the measure.

Implementation phase

- **Organizational:** On-going dialogue with stakeholders (carriers, shopkeepers and neighbourhoods) has been developed in order to overcome the lack of involvement during the Freight Quality Partnership preparation phase.
- **Problem related:** An individualized visit program have been developed in order to attract new companies and retailers.

D3 Description of organisations and risks

D.3.1 Measure partners

Following there is a brief description of all project partners and its level of involvement with the measure:

- **Department of Mobility - City of Donostia-San Sebastian** – Co-responsible for the planning and implementation of the measure. Leading role.
- **Basque Logistics Institute** – Co-responsible for the planning and implementation of the measure. Leading role.

D.3.2 Stakeholders

- **GUITRANS** – Transport Association from Gipuzkoa. They played a significant role in the development of the measure, since they were responsible for the development of the “Study on consolidation possibilities” which drafted the implementation strategy for the CIVITAS Area.
- **Local Police** – The local police is responsible for controlling the adequate use of loading and unloading bays, therefore contributing with its work to the success of the measure.
- **TXITRANS** - Bicycle delivery company. Given its significant role in the development of a new paradigm for urban goods delivery they were fully supported by the Municipality and IVL since the beginning of their operation, even supporting them in the attraction of customers for the service.
- **Pedal** - Bicycle courier company. Like Txitrans, its operation was supported by the Municipality and IVL in the beginning stages of the project.
- **Transport Sector representatives** – They have co-operated in the measure development by providing feedback on the proposed actions and giving advice during the different stages of the measure implementation process.

- **SSHOPS: Shopkeepers Association** – They have co-operated in the measure development by providing feedback on the proposed actions and giving advice during the different stages of the measure implementation process.
- **Department of economic promotion** - They have co-operated in the measure development by providing feedback on the proposed actions and giving advice during the different stages of the measure implementation process.

All together, these stakeholders have formed a consultation committee whose participation has been driven through regular meetings during the measure definition and implementation, as well as direct consultation.

D4 Recommendations

D4 Recommendations

D.4.1 Recommendations: measure replication

- **Background data collection** – Urban goods delivery involves, among other public bodies, the participation of multiple private companies, whose information is not always readily available (both regarding its characteristics and delivery needs associated). An intensive data collection phase is required in order to clearly understand the rationale behind urban goods delivery activity and produce a comprehensive action plan based on it.
- **Location based approach** - It is recommended to approach the rationalization of urban goods delivery in urban areas from a location based approach, considering the possibility to establish urban freights consolidation centres serving a particular are of the city.
- **Balanced strategy** – Increased efficiency in goods delivery may relay to a great extent on an improved operation that most probably will impact carriers usual behaviour, thus seen by this collective as a threat to its actual working conditions. In order to gain their support, a balanced action plan including also measures clearly aiming to ease transport operators' practise.

D.4.2 Recommendations: process

- **Gain support from affected stakeholders:** Urban goods delivery is a very complex activity where many stakeholders are involved and not all measures are well perceived by everyone. A wide consensus regarding the need for action and the way to articulate it guarantees the acceptance of the measure and paves the way for further developments. A Freight Quality Partnership is seen as an ideal tool for this, although it could not be easy to achieve. On-going communication with stakeholders is required for that purpose.
- **Citizen's awareness:** It is very important that citizens are committed with the idea and their support of a behavioural change towards sustainable mobility is also extended to urban goods delivery. Continuous awareness raising activities are required for that purpose.
- **Involve 'champions':** Cooperation with innovative companies, able to guide other through the implementation of innovative solution is also recommended as a success factor in the implementation of this kind of measures.