Measure title: **High Quality Bus Corridors**

City: **Donostia–San Sebastián** *Project:* **ARCHIMEDES** *Measure number:* **16**

Executive Summary

Within this measure the ambitious UNE EN-13816 quality standard on collective passenger transport has been implemented in two main corridors in San Sebastian (lines 5 and 28). The quality standards cover a wide range of service operation aspects, which are monitored on a yearly basis. Complementarily, infrastructural changes have been undertaken in terms of dedicated platform, as well as priority measures, in order to improve public transport reliability and operation.

The measure is part of a package of measures (measures nº 16, 17, 73 and 74) aiming at increasing the quality offered by the public transport service in the municipality of Donostia-San Sebastián, inducing a modal shift toward public transport.

The measure has resulted very successful in this regard, since between 2006 and 2011, there was an increase of 2,55 million extra travellers in CTSS-DBUS's public transport system, which represents a 9,6% increase in the number of users. If compared to the BaU scenario, the improvement in public transport services has resulted in an 8,6% increase in the number of users. It should be highlighted that, according to the surveys conducted, nearly 40% of all new users were former users of the car or motorbike.

From an operational perspective, the improvements in service operation has contributed to achieve an excellent punctuality index of 98,20 on lines 5 & 28. Also, the average speed of buses along the corridors has increased approximately in 2 km/h as compared to the BaU scenario in both lines. Accordingly, the average journey time has experienced a significant reduction of more than 3 minutes.

This improved operation has been acknowledged by the users, whose perceived quality of service has significantly increased, from 7,3 in 2006 to 7,6 after the measure was fully implemented. In this regard, it should be noted that the public perception survey conducted among users has revealed that effectiveness issues (punctuality, reduced journey times,...) are perceived as very important, with an average score of 8,79 in 2011.

On the other hand this package of measures is part of an overall strategy to reduce the number of cars entering the city and circulating within its neighbourhoods. In this regard, the implementation of the High Quality Bus Corridors has contributed to a reduction in the number of cars entering to the CIVITAS corridor of more than 7.500 cars per day.

Overall, this situation has provided significant benefits in the form of better air quality and less carbon emissions, resulting in a better health and quality of life for Donostia-San Sebastian citizens.

Also the revenues from public transport usage have increased due to the implementation of the measure. Compared to the BaU situation, the high quality public transport corridors have increased CTSS-DBUS' revenues by more than 515.000€ in 2011.

Finally, in terms of benefits and costs, the benefit to cost ratio (BCR) is 2,88 which means that benefits are nearly three times larger than costs. This result reveals that the implementation of HQBC is a very cost-effective measure.

A Introduction

A1 Objectives and target groups

A1.1 Objectives

The measure objectives are:

(A) High level / longer term:
The main aim of this measure is to build an optimised and user-friendly environment for public transport modes that will encourage people to use clean, collective transport facilities, for the benefit of citizens and visitors of the city.

(B) Strategic level:
The main objective of the implementation of the two proposed CIVITAS public transport corridors is to connect the existing transport corridors in order to improve interconnectivity of the area and to serve commuters, schools, the university campus, tourist/visitors and leisure trips and connect the three employment areas with the new shuttle services.

(C) Measure level:
The combined ARCHIMEDES measures targeting public transport are expected to result in a 5% increase of passengers in urban buses, meaning 1 million extra passengers during the last project year as compared to 2006. Also, the combined ARCHIMEDES measures are expected to reduce the number of cars entering the city centre by 5% compared to 2006 levels. This specific measure is expected to contribute to achieving these goals.

A1.2 Target groups

The citizens of San Sebastian and visitors that travel by public transport along the two CIVITAS corridors proposed. And also the drivers which might change their daily patterns in mobility from private car to public transport.

A2 Description

Within this measure the ambitious UNE EN-13816 quality standard on collective passenger transport has been implemented in two main corridors in San Sebastian, lines 5 and 28. The quality standards cover eight different aspects, which are monitored by the certification body on a yearly basis. Following is a brief description of the main implications of the quality standard over CTSS-DBUS' (Donostia-San Sebastian public transport company) service provision:

- Offered service: the offered service may guarantee that occupancy rations would not exceed 3 passengers per square metre
- Accessibility: all buses must be adapted to handicapped people
- Information: updated and reliable information regarding service provision and incidences must be provided in all bus stops

- Waiting time and service frequency: waiting time must not exceed in more than 25% the programmed scheduling. Expeditions must not accumulate more than 5 minutes delay or arrive 1 minute before scheduled time.
- Customer attention: a Customer Attention Plan should be in place and a Customer Attention protocol followed by staff. Complains should be answered within 20 days.
- Comfort and cleanliness: there should be an inspection and cleaning protocol to guarantee optimal conditions in terms of comfort and cleanliness
- Security: a Safety and Security Plan should be issued and put in practice
- Environmental impact: low emission vehicles should be operate the service

To reach this more user friendly and reliable service a package of tasks has been implemented.

There is a strong relation with the ARCHIMEDES measures on fleet management and traveller information (Measures 73 and 74).

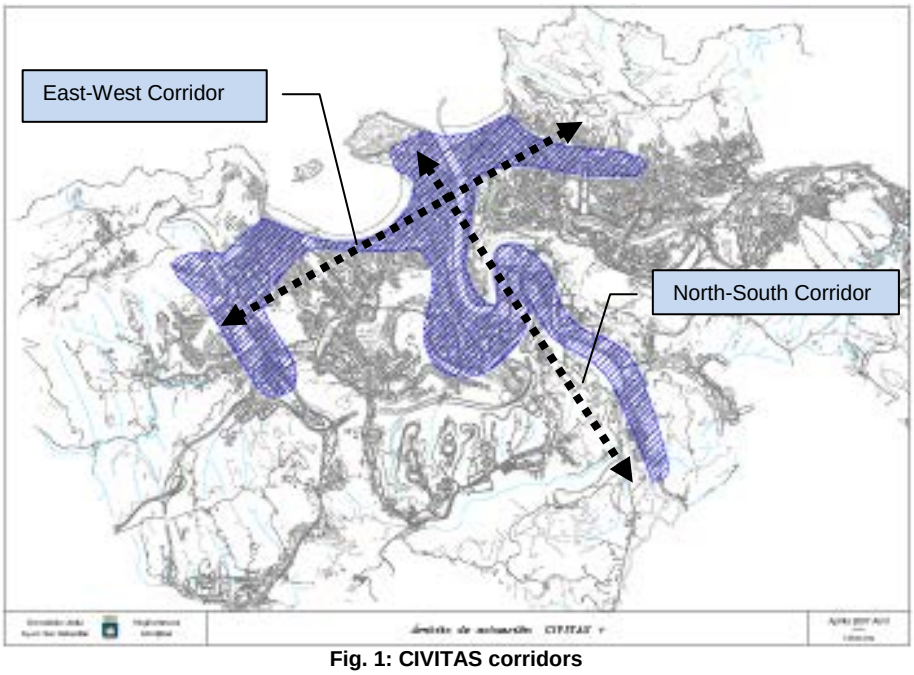

Fig. 1: CIVITAS corridors

Task 11.2.1 Technical Development of High Quality Public Transport Corridors:

A detailed design and planning of the high quality public transport services has been undertaken. The main topics addressed with this study include the design of the exact routes, design of necessary changes in infrastructure and service operation, and development of priority measures. Moreover, the study presents the recommended characteristics of the BRT (Bus Rapid Transit) system proposed to be introduced in Donostia-San Sebastian, covering the following fields:

1. Infrastructure (lane types, stops, guidance systems & intermodality)
2. Operation ways (payment methods & tariff integration)
3. Technology (vehicle, control centre & traffic light priority)
4. Image & excellent customer service (vehicles, reserved bus lanes & stops)
5. Network definition

The design study was completed in month 12 (Milestone 6.2.1).

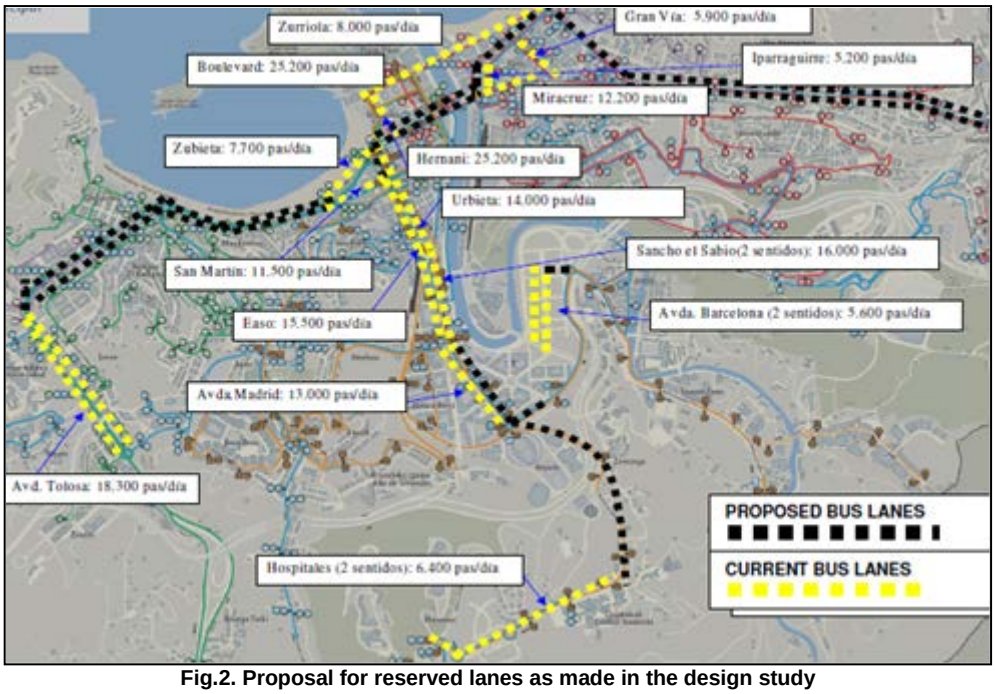

Fig.2. Proposal for reserved lanes as made in the design study

Task 2.10 High Quality Public Transport Corridors:

Following the planning and design phase, two high quality transport corridors were implemented. The corridors combine dedicated platforms for bus lines with all dimensions of quality in public transport according to the UNE EN-13816 quality standard (a detailed description of the implementation process is made in section B4).

For the implementation of the quality standards CTSS-DBUS has been supported by external specialists in the matter. The external support included customer satisfaction surveys of the service provided by the high quality public transport corridor.

In addition a promotion campaign stressing the advantages of the new service was implemented. The campaign was delivered by a specialist communication company in coordination with CTSS-DBUS.

Aware of the importance provided by passengers of the feeling of security as part of the perceived quality, CTSS-DBUS has installed 22 security cameras in the buses that operate the high quality corridors.

In order to improve reliability and average speed of public transport, the city has undertaken the building of a dedicated platform and has reprogrammed UTC´s to ensure PT priority.

Other quality elements like fleet management and traveller information are addressed in separate measures (numbers 73 and 74).

The following tables summarises the main assets of the enhanced High Quality Public Transport Corridors:

Characteristics of LINE 5		
	High Quality Bus Corridors	**"Before" situation**
Route length	9,3 km	9,3 km
Stops	27	27
Average distance between stops	403 m	403 m
Average daily users	9.615	7.754
Yearly users	3.061.246	2.450.231
Dedicated bus lanes	4,3 km (46%)	2,7 km (29%)
Priority intersections	30	0
Frequency	6-8 min	7-14 min
Commercial speed	17,0 km/h	14 km/h
Punctuality	97,6%	91,4 %
Fleet	18 m (articulated) EEV technology	18 m (articulated)
On-board real time information	Yes	No
Stops with real time information	11 (41%)	6 (22%)

Characteristics of LINE 28		
	High Quality Bus Corridors	**"Before" situation**
Route length	11,6 km	11,6 km
Stops	28	28
Average distance between stops	414 m	414 m
Average daily users	15.145	14.683
Yearly users	4.833.325	4.731.537
Dedicated bus lanes	5,1 km (44%)	2,5 km (22%)
Priority intersections	57	0
Frequency	6 min	7-8 min
Commercial speed	17,4 km/h	14 km/h
Punctuality	97,8%	92,4%
Fleet	18 m (articulated) EEV technology	12 m
On-board real time information	Yes	No
Stops with real time information	11 (39%)	7 (25%)

B Measure implementation

B1 Innovative aspects

The innovative aspects of the measure are:

- **New conceptual approach, internationally**: To implement the ambitious UNE EN-13816 quality standard to the collective passenger transport on two main corridors in Donostia-San Sebastian.

- **Use of new technology/ITS, internationally**: the installation of security cameras in the buses that will run on the High Quality corridors. Similar cameras are installed in trains and tramways, but never have been applied in buses.

- **New physical infrastructure solutions, nationally:** the infrastructure that is needed to improve the public transport service in the two corridors includes implementation of dedicated platform and to reprogram UTC´s to ensure PT priority.

B2 Research and Technology Development

A detailed design and planning phase was undertaken for the technical development of the high quality public transport corridor demonstration to be implemented (Task 11.2.1). The main topics addressed with this study include the design of the exact routes, design of necessary changes in infrastructure and service operation, and development of priority measures.

Fig. 3 Conceptual design for HQBC

B3 Situation before CIVITAS

Before CIVITAS-ARCHIMEDES, the existing bus lines on the targeted corridors (line 5 & 28) already served commuters, schools, the university campus, tourist/visitors and leisure trips but not with the high level quality standards to be provided within the project. Also, they were not yet connected to the three employment areas targeted within ARCHIMEDES corridors:

- The bus lines of these corridors were not completely served by 18 metre articulated buses (only line 5 had 18m buses operating)
- The frequency of service along these corridors was lower (every 7-14 minutes)
- Only 7km of bus lanes were implemented in the city
- There was no traffic light priority for buses on crossroads.

B4 Actual implementation of the measure

The measure was implemented according to the following stages:

Stage 1: Study on technical development of the high quality public transport corridor (Sep. 2008 – Sep. 2009)
A detailed design and planning phase was undertaken for the technical development of the high quality public transport corridor demonstration to be implemented (Task 11.2.1). The main topics addressed with this study include the design of the exact routes, design of necessary changes in infrastructure and service operation, and development of priority measures.

Stage 2: Changes in infrastructure (Jan. 2009 – June 2011)
The Mobility Department of Donostia-San Sebastián (ADS) has implemented the necessary infrastructural changes in terms of dedicated platform in order to improve public transport operation, reaching 12 km of bus lanes (which means 5km of additional bus lanes since year 2006). The municipality has also reprogrammed UTC´s in 80 crossroads to ensure PT priority along the two corridors.

Fig. 4. Priority measures for bus operation in Donostia-San Sebastián

Stage 3: Bus services according to the UNE-EN-13816 quality standard (Sep. 2008 – Dic. 2010)

CTSS-DBUS has introduced new enhanced bus services along the two high quality corridors according to the UNE EN-13816 quality standard (lines 5 & 28). From the operational side, the main improvements with the innovative urban BRT lines are:

- Lines 5 & 28 are now completely served by 18 metre articulated buses (high capacity).
- Frequency services of 6-8 minutes.
- Contactless payment system.
- Improved punctuality, reliability by means of the new management system.
- Improved accessibility, security and intermodality standards.
- Clean and ecological buses: biofuels 30% blend, EEV engines, less noise.
- Traveller information system: at stops, onboard, on mobile phones and on website.
- Renewed attractive image: little frog and green-blue colours.

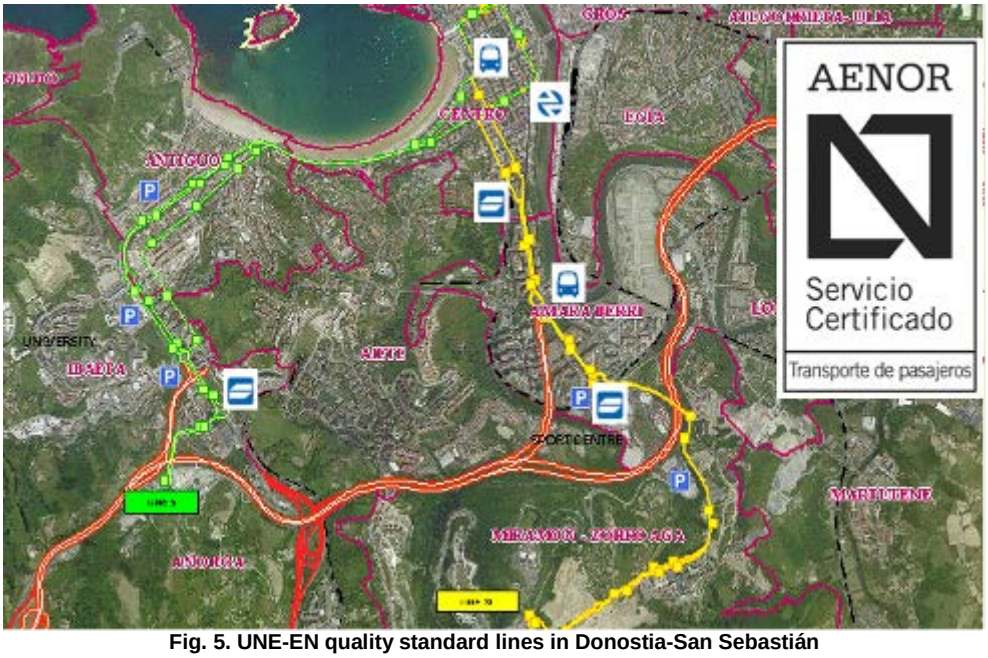

Fig. 5. UNE-EN quality standard lines in Donostia-San Sebastián

Stage 4: Promotional campaigns (Mar. 2010 – Sep. 2012)

A promotion campaign stressing the advantages of the new service has been implemented on March 2010 and delivered also during years 2011 and 2012. The promotion campaign included a promotional video which can be viewed on-line, among others, through CTSS-DBUS's web-site:

Fig 6. CTSS-DBUS's promotional video

Stage 5: Installation of security cameras in buses (Mar. 2009)

An important element of quality is the feeling of security of the bus passengers. For this reason CTSS-DBUS has installed 22 security cameras in the buses that run along the high quality corridors (all buses that serve lines 5 & 28).

Fig.7 Security cameras in CTSS-DBUS buses

B5 Inter-relationships with other measures

This measure is directly complemented by the Innovative Transport Telematics measures in WP8 – state of the art travel information and bus fleet management systems. Being the backbone of the local CIVITAS programme, this measure is integrated with all measures directed at increasing the use of public transport, especially: the business district shuttle buses that connect to the corridors, the P&R measures, and the pricing strategy for parking in the city centre and the employment areas, and also the different types of travel plans. The buses operating on the corridors will run on high blends of bio-diesel.

C Planning of Impact evaluation

C1 Measurement methodology

C1.1 Impacts and indicators

C1.1.0 Scope of the impact

This measure is part of a package of measures (measures nº 16, 17, 73 and 74) aiming at increasing the quality offered by the public transport service in the municipality of Donostia-San Sebastián. The development of an optimised and user-friendly environment for public transport modes is expected to encourage citizens to make a higher use of collective transport, shifting from private cars to public transport.

This particular measure contributes to this goal by increasing quality standards in public transport supply and enhancing bus operation by means of dedicated right-of-ways and traffic priority measures in two main corridors. These two high quality routes will become the backbone of the municipal bus system, favouring a fast connexion with other routes and modes.

This package of measures is part of an overall strategy to reduce the number of cars entering the city and circulating within its neighbourhoods, which is expected to provide benefits in the form of better air quality, less carbon emissions and reduced noise levels, resulting in a better health and quality of life for Donostia-San Sebastian citizens.

Modal shift to public transport modes will impact traffic performance, reducing congestion, allowing motorized modes to achieve better travel times, and in the case of public transport services, making it more reliable, thus contributing to increase its attractiveness to users.

Also the increase in the number of users of public transport will increase the operating revenues of the public transport company (as well as will reduce operation and maintenance costs), making it able to invest in higher quality standards for bus service operation.

C1.1.1 Selection of indicators

NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
	ECONOMY					
1		**Benefits**	Operating Revenues	Operating revenues	Revenues per pkm	Euros/km, quantitative, derived or measurement
2a		**Costs**	Capital Costs	Capital Costs	Capital cost per system or unit	Euros/km, quantitative, derived or measurement
2b			Operating costs	Operating costs	Costs per pkm	Euros/km, quantitative
2b			Maintenance Costs	Maintenance Costs	Costs per pkm	Euros/km, quantitative
	ENVIRONMENT					
8		**Pollution and Nuisance**	Emissions	CO_2 emissions	Yearly CO_2 emissions	Tm, quantitative, derived
9				CO emissions	Yearly CO emissions	Tm, quantitative, derived
10				NOx emissions	Yearly Nox emissions	Tm, quantitative, derived
11				Particulate emissions	Yearly PM_{10} and $PM_{2,5}$ emissions	Tm, quantitative, derived
	SOCIETY					
17		**Safety**	Transport Safety	Feeling of security	Perception of quality of service in relation to transport security	Index, qualitative, collected, survey
		Acceptance	Public perception	Public perception level	Impact on public perception derived from the measure. This indicator will be used to estimate the influence of this measure on modal shift towards public transport.	Percentage, qualitative, collected survey.
	TRANSPORT					
18		**Quality of Service**	Service reliability	Accuracy of timekeeping	Number and percentage of services arriving / departing on time	No and %, quantitative, collected, measurement
19		**Quality of Service**	Quality of service	Quality of service	Perception of quality of service	Index, qualitative, collected, survey
20		**Safety**	Transport Safety	Injuries and deaths caused by transport accidents	Number of accidents, fatalities and casualties caused by transport accidents	No, Quantitative, measurement
23/24		**Transport system**	Congestion Levels	Average speed of buses along the corridors	Average vehicle speed (peak and off peak hours)	Km/h, quantitative, derived
		Quality of Service	Modal split	Number of PT passengers	Number of PT passengers	No, quantitative, measurement
		Transport system	Time savings	Average journey time	Average journey time (peak and off peak hours)	Minutes per trip, quantitative, derived
		Transport system	Traffic Levels	Number of private cars entering the city along the CIVITAS corridors	Number of private cars (ADS is responsible)	No, quantitative, measurement

C1.1.2 Methods for evaluation of indicators

No.	INDICATOR	TARGET VALUE	Source of data and methods	Frequency of Data Collection
1	Operating revenues	Contribute to a 5% increase compared to 2006	The increase of 5% of passengers cause an increment of the operating revenues, compared to 2006	Annual
2a	Capital costs	Not defined	Annual amortization of the expenses in studies, security cameras, certification, etc. (PT operator), as well as priority measures and infrastructures (municipality).	Annual
2b	Operating costs	Maintain costs (only IPC)	Annual operation personnel cost (drivers and operation management staff) plus fuel expenses.	Annual
2b	Maintenance Costs	Maintain costs (only IPC)	Annual workshop costs (reparation and maintenance staff plus materials).	Annual
8,9,10, 11	CO_2, CO, NOx, PM emissions		The emissions module from traffic model software used at city level has been used to estimate emissions. Modal shift and trip characteristics (origin/destination, speed,...) are the main inputs for this module.	Annual
17	Feeling of security	Security Index of 7	Data have been collected through a yearly on-board survey conducted among the users of public transport (undertaken in November every year), complemented by a continuous web based survey throughout the year. The survey will include acceptance in relation to this specific measure and public transport in general. A sample size of 600 users is foreseen.	Annual
	Public perception level		Data have been collected through a yearly on-board survey conducted among the users of public transport, complemented by a continuous web based survey throughout the year. The survey will include public perception levels in relation to this specific measure and public transport in general. Also, the relative weight of this measure in modal shift towards public transport will be surveyed. A sample size of 600 users is foreseen.	Once a year
18	Accuracy of timekeeping	Punctuality Index of 90%	The AVL (Automatic Vehicle Location) system system registers the number and percentage of services arriving and departing on time according to UNE-EN-13816 standard (i.e. a maximum of 1 minute before scheduled or 5 minutes later than scheduled)	Monthly
19	Quality of service	Quality Index of 7	Data have been collected through a yearly on-board survey conducted among the users of public transport (undertaken in November every year), complemented by a continuous web based survey throughout the year. The survey will include acceptance in relation to this specific measure and public transport in general. A sample size of 600 users is foreseen.	Annual
20	Injuries and deaths caused by transport accidents	Maximum 10 injuries/month	Statistics of injuries caused by transport accidents will be collected according to UNE-EN-13816 standard	Monthly
23/24	Average speed of buses along the corridors	14 km/hr	The AVL system registers the average speed of the bus services of each corridor	Monthly (average per week-day)
	Number of PT passengers	1 million extra passengers compared to 2006 (increase of 5%)	The AVL system registers the number of passengers that use PT	Annual
	Average journey time	1st corridor: 27 minutes 2nd corridor: 24 minutes	The AVL system registers the average journey time of the bus services of each corridor	Monthly (average per week-day)
	Number of private cars entering the city along the CIVITAS corridors	Reduce the 5% the number of cars entering compared to 2006	ADS is responsible for the monitoring of the number of private cars entering the city centre along the CIVITAS corridors.	Annual (average per week-day)

C1.1.3 Planning of before and after data collection

EVALUATION TASK	INDICATORS INVOLVED	COMPLETED BY (DATE)	RESPONSIBLE ORGANISATION AND PERSON
Analysis of financial accounts.	1, 2a, 2b	Months 15, 27, 39	CTSS-DBUS / Javier Vallejo
Survey to estimate feeling of security and quality of service	17,19	Months 14,26, 38	CTSS-DBUS / Javier Vallejo
Survey to estimate public perception levels	-	Months 26, 38	CTSS-DBUS / Javier Vallejo
Data collection from AVL system regarding bus operation	8, 9, 10, 11, 18, 23, 24	Continuously from M12 onwards	CTSS-DBUS / Javier Vallejo
Data collection from AVL system regarding number of passengers	-	Months 15, 27, 39	CTSS-DBUS / Javier Vallejo
Police records on injuries and deaths caused by transport accidents	20	Continuously from M12 onwards	CTSS-DBUS / Javier Vallejo
Traffic counts and/or traffic modelling	-	Months 27, 39	CTSS-DBUS / Javier Vallejo
D12.2 Baseline and first results from data collection	All indicators	Month 39	CTSS-DBUS / Javier Vallejo
D12.3 Draft results template available	All indicators	Month 44	CTSS-DBUS / Javier Vallejo
D12.4 Final version of results template available	All indicators	Month 46	CTSS-DBUS / Javier Vallejo

C1.2 Establishing a baseline

In 2006 Donostia-San Sebastian already accounted for a rather good public transport service, highly accepted by the users, but whose quality standards were suitable for improvement. Also, public transport services were increasingly affected by increasing traffic levels in the city.

Over the years CTSS-DBUS has followed a twofold approach for the evaluation of its performance:

- On the one hand, system operation indicators were assessed in order to evaluate the technical performance of the offered services. Nevertheless, until 2008 when a complete Bus Management System was implemented, only very basic variables were assessed (number of users, average journey times, etc.), while indicators such as commercial speed, punctuality, etc. were out of the scope
- On the other hand, public perception of the quality of service provided has always been a major issue for CTSS-DBUS. Consequently, yearly surveys in order to assess public acceptance are conducted since year 2002.

During the CIVITAS-ARCHIMEDES project, this twofold approach has been maintained, although data collection has been enhanced and the selection of system operation indicators enlarged. In addition, indicators concerning the environmental (emission levels) and system impacts (traffic reduction) of the improvements in public transport operation has been incorporated to evaluation procedures. A modelling software has been used for that purpose.

C1.3 Method for Business as usual scenario

If this measure would not be implemented, the public transport network would operate the same routes as today and the evolution in terms of exclusive infrastructure and priority measures would follow the same patterns as in the previous last years. So would be the case in terms of operational variables, such as commercial speed, quality standards and public acceptance. As a conclusion, BaU scenario would lead to less competitive and attractive public transport service, and thus a decrease in its patronage. It is expected that the following consequences will happen:

- No increase of the total number of annual public transport users, and probably a reduction.
- Reduction of customer satisfaction in the service along the corridors.
- Longer average journey time of buses along the corridors.
- Lower average speed of buses along the corridors.
- More cars entering in the city along the corridors.
- Less security perception.

For evaluation purposes, the following criteria have been used to estimate the BaU scenario:

- Economic indicators: the revenue and operation cost factors of the reference year has been actualized according to inflation levels (whether recorder or estimated,

depending on the year considered): As for the capital costs, it has been considered that no further investments would have occur if the CIVITAS funds were not available.

The inflation rate used for BaU calculations are:

Inflation rate	
2006	2,70%
2007	4,20%
2008	1,40%
2009	0,80%
2010	3,00%
2011	2,40%
2012-2020	2,00% (estimated)

- Environmental indicators: these indicators have resulted from the transport demand model used to assess future modal shift and emissions in the city due to the CIVITAS measures.

  A BaU scenario assuming that no changes in public transport services would be implemented has been also modelled.

- Society indicators: before the CIVITAS project, there was not a regular survey program to assess public perception regarding public transport services or the filing of security among public transport users, therefore is not possible to estimate a BaU scenario for these indicators.

- Transport indicators: the BaU scenario has been estimated according to the evolution trend observed in the previous years to the implementation of the measure. In particular the 5 years previous to the reference year (2002-2006) has been used:

  i. Accuracy of timekeeping: a 0,24% yearly growth has been observed during the pre-CIVITAS years
  ii. Quality of service: there is not a clear pattern able to be used to extrapolate the BaU case for this indicator , therefore the average of the 5 years previous to the reference year (2002-2006) has been used, resulting an index of 6,6.
  iii. Injuries and deaths caused by transport: there is not a clear pattern able to be used to extrapolate the BaU case for this indicator, therefore the average of the 5 years previous to the reference year (2002-2006) has been used, resulting an average of 4 injuries and deaths.
  iv. Average speed of buses: an increase of 0,12 km/h and 0,15 km/h per year in lines 28 and 5 respectively is estimated
  v. Average journey time: calculated according to the variation in average speed of buses over the time
  vi. Number of PT users: a 0.18% yearly growth has been observed
  vii. Number of cars entering the CIVITAS corridor: this indicator results from the traffic demand model for the BaU scenario, assuming that no changes in public transport services would be implemented

C2 Measure results

C2.1 Economy

Table C2.1.1: Benefits

Indicator	Before 2006	BaU 2010	After 2010	BaU 2011	After 2011
1.Operating Revenues	4,21 €/km	4,62 €/km	5,24 €/km	4,73 €/km	5,22 €/km

Indicator	Difference: 2010 –Before	Difference: 2010 – BaU	Difference: 2011 –Before	Difference: 2011 – BaU
1.Operating Revenues	1,03 €/km	0,62 €/km	1,01 €/km	0,49 €/km

The increase of the revenues per kilometre on lines 5 & 28 of the ARCHIMEDES high quality public transport corridors are due to the fares increases and mainly to the important increase of passengers in these bus lines. Compared to the BaU situation, the high quality public transport corridors have increased CTSS-DBUS' revenues by more than 515.000€ in 2011.

Table C2.1.2: Costs

Indicator	Before 2006	BaU 2010	After 2010	BaU 2011	After 2011
2a. Capital costs	0 €/km	0 €/km	0,09 €/km	0 €/km	0,09 €/km
2b. Operating costs	3,08 €/km	3,38€/km	3,52 €/km	3,46 €/km	3.65 €/km
2b. Maintenance costs	0,36 €/km	0,39 €/km	0,43 €/km	0,40 €/km	0,42 €/km

Indicator	Difference: 2010 –Before	Difference: 2010 – BaU	Difference: 2011 –Before	Difference: 2011 – BaU
2a. Capital costs	0,09 €/km	0,09 €/km	0,09 €/km	0,09 €/km
2b. Operating costs	0,44 €/km	0,14 €/km	0,57 €/km	0,19 €/km
2b. Maintenance costs	0,07 €/km	0,04 €/km	0,06 €/km	0,02 €/km

Even though CTSS-DBUS has optimized all kind of costs by using the expert planning and fleet management system (Measure 74), operating and maintenance costs have increased due to the required fleet increase to implement the measure and higher labour costs.

C2.2 Environment

Table C2.2.1: Pollution and Nuisance

Indicator	Before 2006	BaU 2010	After 2010	BaU 2011	After 2011
8. CO_2 emissions	228.619 Tm	249.777 Tm	249.753 Tm	255.132 Tm	255.044 Tm
9. CO emissions	20.003 Tm	21855 Tm	21.853 Tm	22.318 Tm	22.315 Tm
10. NOx emissions	1.430 Tm	1.562 Tm	1.542 Tm	1.595 Tm	1.577 Tm
11. Particulate emissions	10.521 Tm	11.301 Tm	11.299 Tm	11.497 Tm	11.494 Tm

Indicator	Difference: 2010 –Before	Difference: 2010 – BaU	Difference: 2011 –Before	Difference: 2011 – BaU
8. CO_2 emissions	21.134 Tm	-24 Tm	26.425 Tm	-88 Tm
9. CO emissions	1.850 Tm	-2 Tm	2.312 Tm	-3 Tm
10. NOx emissions	112 Tm	-20 Tm	147 Tm	-18 Tm
11. Particulate emissions	778 Tm	-2 Tm	973 Tm	-3 Tm

Significant air pollution emissions reduction has been achieved by the measure. It should be borne in mind when analysing these results that the effect of the use of bio-fuels in CTSS-DBUS bus services has been excluded of this assessment. Therefore, the reduction in all pollutant emission has been achieved through an improved efficiency as well as the modal shift induced by the increased quality of service. This improved quality of service includes higher frequencies (i.e. more vehicles operating) which is something that should also be borne in mind when analysing the result.

C2.3 Society

Table C2.3.1: Safety

Indicator	Before 2006	BaU 2010	After 2010	BaU 2011	After 2011
17. Feeling of security	NOT AVAILABLE	NOT AVAILABLE	8,01	NOT AVAILABLE	7,91

Indicator	Difference: 2010 –Before	Difference: 2010 – BaU	Difference: 2011 –Before	Difference: 2011 – BaU
17. Feeling of security	NOT AVAILABLE	NOT AVAILABLE	NOT AVAILABLE	NOT AVAILABLE

The implementation of surveillance security camera system has contributed to the customer's feeling of security demonstrated with an excellent index of 7,91 in 2011 in the surveys carried out on lines 5&28 to 625 travellers (the 5% of the daily passengers)

Table C2.3.2: Acceptance

Indicator	Before 2006	BaU 2010	After 2010	BaU 2011	After 2011
Public perception level (effectiveness)	NOT AVAILABLE	NOT AVAILABLE	8,90	NOT AVAILABLE	8,79

Indicator	Difference: 2010 –Before	Difference: 2010 – BaU	Difference: 2011 –Before	Difference: 2011 – BaU
Public perception level (effectiveness)	NOT AVAILABLE	NOT AVAILABLE	NOT AVAILABLE	NOT AVAILABLE

To assess the public perception level of the different measures implemented by CTSS-DBUS within CIVITAS, a survey was carried out among 1.500 users of lines 5 & 28 (12% of the daily passengers). The results reveal that effectiveness issues (punctuality, reduced journey times,...) are perceived as very important, with an average score of 8,79 in 2011.

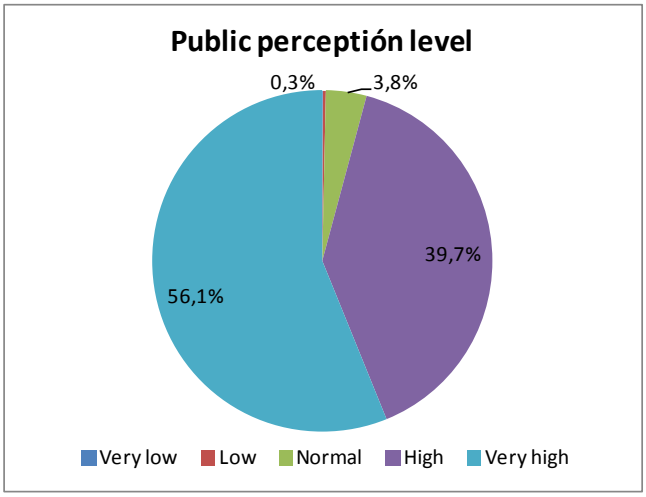

Fig.8 Public perception level

This result is in concordance with the contribution of the innovative urban BRT lines 5 & 28 to an increase of 9,5% in public transport travellers. This has been possible thanks to the public transport effectiveness and the users' acceptance of the global service.

C2.4 Transport

Table C2.4.1: Quality of Service

Indicator	Before 2006	BaU 2010	After 2010	BaU 2011	After 2011
18. Accuracy of timekeeping	92,0 %	93,00 %	97,60 %	93,25 %	98,20 %
19. Quality of service	7,30	6,66	7,64	6,66	7,61
Number of PT passengers	26.670.005	26.859.362	29.015.077	26.907.709	29.216.698

Indicator	Difference: 2010 –Before	Difference: 2010 – BaU	Difference: 2011 –Before	Difference: 2011 – BaU
18. Accuracy of timekeeping	5,60 %	4,60 %	6,20 %	4,95 %
19. Quality of service	0,34	0,98	0,31	0,95
Number of PT passengers	2.345.072	2.155.715	2.546.693	2.308.989

The implementation of the innovative urban BRT lines 5 & 28 (with bus lanes, light priority on crossroads, quality standards, 18 metre articled buses, etc) has contributed to an increase in the perceived quality of service with an index of 7,61 in 2011 (as compared to the 7,30 achieved in 2006).

Improvements in service operation has also contributed to achieve an excellent punctuality index of 98,20 on lines 5 and 28. As a result, between 2006 and 2011, there was an increase of 2,55 million extra travellers in CTSS-DBUS's public transport system, which represents a 9,6% increase in the number of users. If compared to the BaU scenario, the improvement in public transport services has resulted in an 8,6% increase in the number of users.

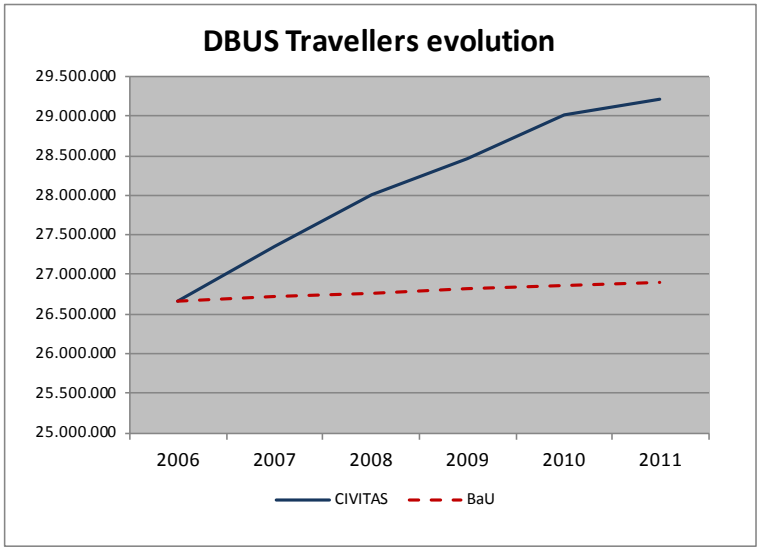

Fig.9 DBUS travellers evolution

It should be highlighted that, according to the surveys conducted in lines 5 and 28, nearly 40% of all new users were former users of the car or motorbike.

Table C2.4.2: Safety

Indicator	Before 2006	BaU 2010	After 2010	BaU 2011	After 2011
20. Injuries and deaths caused by transport accidents	4,2 average per month	4,0 average per month	4,6 average per month	4,0 average per month	3,6 average per month

Indicator	Difference: 2010 –Before	Difference: 2010 – BaU	Difference: 2011 –Before	Difference: 2011 – BaU
20. Injuries and deaths caused by transport accidents	0,4 average per month	0,6 average per month	-0,6 average per month	-0,4 average per month

After a slight increase in the number of the monthly accidents in 2010 (10%) due to the 15% fleet increase (from 105 vehicles in 2006 to 121 vehicles in 2010), in 2011 the number of injuries and deaths has decreased by 22% as compared with the previous year, reaching lower levels than in 2006. This is a significant result, considering that the number of buses operating and the mileage has increased as compared to the base year.

For the BaU scenario it was not possible to obtain a pattern based on previous years, therefore it has been considered that the average number of injuries and deaths caused by public transport accidents remains stable over time.

Table C2.4.3: Transport System

Indicator	Before 2006	BaU 2010	After 2010	BaU 2011	After 2011
23/24. Average speed of buses along the corridors	14 km/h (L28) 12,6 km/h (L5)	14,5 km/h (L28) 13,2 km/h (L5)	16,7 km/h (L28) 15,4 km/h (L5)	14,6 km/h (L28) 13,3 km/h (L5)	16,2 km/h (L28) 15,2 km/h (L5)

Average journey time	26,0 min (L28) 23,0 min (L5)	25,1 min (L28) 21,9 min (L5)	20,9 min (L28) 18,7 min (L5)	24,9 min (L28) 21,7 min (L5)	21,4 min (L28) 18,6 min (L5)
Number of private cars entering the CIVITAS corridor	51.343 cars per day	44.384 cars per day	44.089 cars per day	44.015 cars per day	43.720 cars per day

Indicator	**Difference: 2010 –Before**	**Difference: 2010 – BaU**	**Difference: 2011 –Before**	**Difference: 2011 – BaU**
23/24. Average speed of buses along the corridors	2,7 km/h (L28) 3,4 km/h (L5)	2,2 km/h (L28) 2,2 km/h (L5)	2,2 km/h (L28) 2,6 km/h (L5)	1,6 km/h (L28) 1,9 km/h (L5)
Average journey time	-5,1 min (L28) -4,3min (L5)	-4,2min (L28) -3,2 min (L5)	-4,6 min (L28) -4,4 min (L5)	-3,5 min (L28) -3,1 min (L5)
Number of private cars entering the CIVITAS corridor	-7.254 cars per day	-294 cars per day	-7623 cars per day	-295 cars per day

The average speed of buses along the corridors has increased approximately in 2 km/h as compared to the BaU scenario in both lines (5 & 28). Accordingly, the average journey time has experienced a significant reduction of more than 3 minutes. It can be inferred that this improvement in public transport performance has attracted new users from car since the number of cars entering to the CIVITAS corridor has been reduced in more than 7.500 cars per day as compared to the before situation. This situation has been possible due to the implementation of the BRT lines along the CIVITAS high quality public transport corridors and is extremely related with the extra 2,55 travellers in CTSS-DBUS.

C2.5 Cost benefit analysis

The CBA of this measure focuses on the effect of improved operation and quality standards in bus lines 5 and 28, as well as the priority measures implemented in the High Quality Bus Corridors. Therefore, costs and benefits related to the use of clean vehicles and alternative fuels will be omitted, since these are addressed within M4's CBA.

There are three other measures within Donostia-San Sebastian that are directed towards an increase in public transport usage which are strongly linked to this measure. These are measures nº 17 (better public transport access to business areas), 73 (improved user information) and 74 (enhanced management system). The effects of these measures have also been taken into account in this CBA, which together contribute to a modal shift towards public transport, being this the main driver for benefits in this analysis.

C2.5.1 Evaluation period for CBA

In this case, the evaluation period is set according to the expected technical life of the fleet that will operate the new high quality corridors, which are new articulated EEV vehicles. According to CTSS-DBUS criteria and suppliers' technical recommendations, the technical life of EEV vehicles is estimated in 10 years.

A reference case is required for comparison with the CIVITAS measure. The BaU scenario is used for that purpose. If this measure would have not been implemented, the public transport network would operate the same routes as in previous years and the evolution in terms of exclusive infrastructure and priority measures would follow the same patterns as in the previous last years. So would be the case in terms of operational variables, such as commercial speed, quality standards and public acceptance. As a conclusion, BAU scenario

would lead to less competitive and attractive public transport service, and thus a decrease in its patronage.

Following EU recommendations a discount rate of 3.5% is used for the analysis.

C2.5.2 Method and values for monetisation

As a first step in the monetisation of the expected impacts of the measure, the main parties affected by the measure are identified. It is expected that the implementation of this measure will affect the following stakeholders:

Agent	Implications
Public Transport Operator	Have conducted the study, as well as subcontracted the external support for the implementation of the UNE EN-13186. Also, CTSS-DBUS have borne the expenses derived from the implementation of the new quality standards and the security cameras, as well as the operation and maintenance cost of the PT service. On the other hand, it is expected that this measure results in a significant increase in the number of users of public transport. Operating revenues are expected to grow accordingly.
City Administration	The City Administration is responsible for infrastructural changes and the reprogramming of UTC's to ensure PT priority.
Public Transport Users	Former bus users benefit from journey time reductions and a higher quality supply (from better reliability and information, to increased comfort and security). On the contrary, new bus users who sift from driving may experience time losses, due to the higher average speed of the car.
Car Users	Due to the expected modal shift from private car to public transport resulting from the implementation of this measure, traffic congestion is expected to decrease. Therefore, car users would benefit from reduced travel times. Nevertheless, some particular routes may be slightly worsened in terms of journey times, due to the new priority management criteria applied over PT routes along high quality corridors. It is assumed that these two effects compensate each other. Therefore this impact will be omitted. From an economical point of view, less congestion would result in decreased operation and maintenance costs for car users (less queues and stop-an-go's). This effect will be compensated by the increased traffic flows in PT priority routes.
Society	Donostia-San Sebastian citizens, especially those living around the high quality corridors, benefit from an improvement on air quality due to the reduced emissions derived from an increased public transport usage and the corresponding decrease in private car use, as well as from a better traffic performance (less congestion).

Prior to its monetisation, the main impacts of the measure are synthesized in the following table in the form of cost and benefits affecting the above referred parties:

Agent	Cost	Benefit
Public transport operator	– Studies and UNE EN-13186 costs – Capital costs (security cameras and other improvements, information systems, HSDPA-3G communication system) – Operation and maintenance(1) – Promotion activities costs	– Increased revenues – Improved public image(2)
City Administration	– Capital costs (infrastructure and priority measures)	
Public transport users	– Time losses (former drivers)	– Time savings – Quality benefits
Society		– Better air quality – Less carbon emissions

(1) Even though CTSS-DBUS has optimized all kind of costs by using the expert planning and fleet management system (Measure 74), operating and maintenance costs have increased due to the required fleet increase to implement the measure and higher labour costs

(2) Difficult to assess: omitted

Following is a brief description on how the impacts have been assessed and monetised, including the reference values used for its conversion to money values where applicable:

- Operating revenues: increased fare revenue and incomes coming from advertisements in vehicles and bus stops are considered.

  For the reference year it is considered that revenues follow the same patter as the number of PT users would do if the CIVITAS measure would have not been implemented.

- Capital costs: The capital costs are calculated as the annual amortization of the expenses in studies, security cameras, certification, etc. (PT operator). Following CTSS-DBUS' standard criteria, a 10 years depreciation period has been considered. Investment costs in priority measures (bus-lanes infrastructure and reprogramming of UTCs) during the CIVITAS period have also been accounted (City Administration)

  For the reference case it has been considered that no further investments would have occur if the CIVITAS funds were not available

- Operation and maintenance costs: these costs include the annual salaries of drivers and the management staff, in addition to the costs associated to CTSS-DBUS' workshop. It is assumed that after the CIVITAS project finishes there would not be changes in the offered service. Therefore, operation and maintenance costs would only be affected by inflation in the future years.

  The estimation of the reference case has been done assuming that the offered service and priority infrastructure remains as in pre-CIVITAS years.

- Modal split and time savings: these indicators have resulted from the transport demand model used to assess future modal shift and emission in the city due to the CIVITAS measures. A BaU scenario assuming that no changes in public transport services would be implemented has been also modelled.

- Time savings: an average value of time of 15€/h has been used in the calibration of the transport demand model. This same figure has been considered within the CBA for the monetisation of time savings.

- CO_2 and pollutant emissions: these indicators have also resulted from the transport demand model used to assess future modal shift and emission in the city due to the CIVITAS measures. A BaU scenario assuming that no changes in public transport services would be implemented has been also modelled.

  The following sources have been used for the monetisation of these impacts:

Pollutant	Cost factor	Value year	Source
CO_2	25 €/tonne (2010) 40 €/tonne (2020)	-	IMPACT 2008 (Central value)
HC	400 €/tonne	€ 2000	IMPACT 2008 (CAFÉ)
NOx	2600 €/tonne	€ 2000	IMPACT 2008 (CAFÉ)
PM10	119900 €/tonne	€ 2000	IMPACT 2008 (HEATCO Metropolitan / Urban)
PM2,5	299600 €/tonne	€ 2000	IMPACT 2008 (HEATCO Metropolitan / Urban)

C2.5.3 Life time cost and benefit

Table C2.5.1 Capital cost in the evaluation period (not discounted)

	Cases for comparison	Cost (e.g. €200,000)
Year 1	CIVITAS measure	0,00
	Reference case (or BAU)	0,00
Year 2	CIVITAS measure	297.943,78
	Reference case (or BAU)	0,00
Year 3	CIVITAS measure	323.111,78
	Reference case (or BAU)	0,00
Year 4	CIVITAS measure	321.238,78
	Reference case (or BAU)	0,00
Year 5	CIVITAS measure	98.140,46
	Reference case (or BAU)	0,00
Year 6	CIVITAS measure	101.084,67
	Reference case (or BAU)	0,00
Year 7	CIVITAS measure	104.117,21
	Reference case (or BAU)	0,00
Year 8	CIVITAS measure	107.240,73
	Reference case (or BAU)	0,00
Year 9	CIVITAS measure	110.457,95
	Reference case (or BAU)	0,00
Year 10	CIVITAS measure	113.771,69
	Reference case (or BAU)	0,00

Table C2.5.2 Operation costs in the evaluation period (not discounted)

	Cases for comparison	Cost (e.g. €200,000)
Year 1	CIVITAS measure	21.270.105,00
	Reference case (or BAU)	19.654.389,75
Year 2	CIVITAS measure	21.800.700,00
	Reference case (or BAU)	20.003.859,21
Year 3	CIVITAS measure	22.526.293,73
	Reference case (or BAU)	21.605.723,46
Year 4	CIVITAS measure	23.541.550,05
	Reference case (or BAU)	22.281.619,61
Year 5	CIVITAS measure	24.012.381,05
	Reference case (or BAU)	22.727.252,00
Year 6	CIVITAS measure	24.492.628,67
	Reference case (or BAU)	23.181.797,04
Year 7	CIVITAS measure	24.982.481,25
	Reference case (or BAU)	23.645.432,98
Year 8	CIVITAS measure	25.482.130,87
	Reference case (or BAU)	24.118.341,64
Year 9	CIVITAS measure	25.991.773,49
	Reference case (or BAU)	24.600.708,47
Year 10	CIVITAS measure	26.511.608,96
	Reference case (or BAU)	25.092.722,64

Table C2.5.3 Maintenance costs in the evaluation period (not discounted)

	Cases for comparison	Cost (e.g. €200,000)
Year 1	CIVITAS measure	2.626.939,00
	Reference case (or BAU)	2.274.940,91
Year 2	CIVITAS measure	2.796.977,00
	Reference case (or BAU)	2.315.391,03
Year 3	CIVITAS measure	2.740.209,41
	Reference case (or BAU)	2.500.802,35
Year 4	CIVITAS measure	2.723.512,39
	Reference case (or BAU)	2.579.035,45
Year 5	CIVITAS measure	2.777.982,64
	Reference case (or BAU)	2.630.616,16
Year 6	CIVITAS measure	2.833.542,29
	Reference case (or BAU)	2.683.228,48
Year 7	CIVITAS measure	2.890.213,14
	Reference case (or BAU)	2.736.893,05
Year 8	CIVITAS measure	2.948.017,40
	Reference case (or BAU)	2.791.630,92
Year 9	CIVITAS measure	3.006.977,75
	Reference case (or BAU)	2.847.463,53
Year 10	CIVITAS measure	3.067.117,30
	Reference case (or BAU)	2.904.412,80

Table C2.5.4 Revenue in the evaluation period (not discounted)

	Cases for comparison	Cost (e.g. €200,000)
Year 1	CIVITAS measure	18.163.807,65
	Reference case (or BAU)	16.881.914,01
Year 2	CIVITAS measure	20.137.343,33
	Reference case (or BAU)	17.182.086,81
Year 3	CIVITAS measure	20.263.437,94
	Reference case (or BAU)	18.557.989,85
Year 4	CIVITAS measure	21.306.065,03
	Reference case (or BAU)	19.138.543,14
Year 5	CIVITAS measure	21.732.186,33
	Reference case (or BAU)	19.521.314,00
Year 6	CIVITAS measure	22.166.830,06
	Reference case (or BAU)	19.911.740,29
Year 7	CIVITAS measure	22.610.166,66
	Reference case (or BAU)	20.309.975,09
Year 8	CIVITAS measure	23.062.369,99
	Reference case (or BAU)	20.716.174,59
Year 9	CIVITAS measure	23.523.617,39
	Reference case (or BAU)	21.130.498,08
Year 10	CIVITAS measure	23.994.089,74
	Reference case (or BAU)	21.553.108,05

Table C2.5.5 Costs from journey times (not discounted)

	Cases for comparison	Cost (e.g. €200,000)
Year 1	CIVITAS measure	405.181.175,77
	Reference case (or BAU)	406.458.061,01
Year 2	CIVITAS measure	418.689.891,39
	Reference case (or BAU)	420.003.057,05
Year 3	CIVITAS measure	429.914.100,00
	Reference case (or BAU)	431.255.891,87
Year 4	CIVITAS measure	448.271.074,52
	Reference case (or BAU)	449.663.188,50
Year 5	CIVITAS measure	465.411.289,12
	Reference case (or BAU)	466.849.285,51
Year 6	CIVITAS measure	483.032.396,31
	Reference case (or BAU)	484.517.107,48
Year 7	CIVITAS measure	501.146.385,83
	Reference case (or BAU)	502.678.654,34
Year 8	CIVITAS measure	519.765.528,50
	Reference case (or BAU)	521.346.207,10
Year 9	CIVITAS measure	538.902.382,53
	Reference case (or BAU)	540.532.334,19
Year 10	CIVITAS measure	558.569.800,04
	Reference case (or BAU)	560.249.897,99

Table C2.5.6 Costs from environmental emissions (not discounted)

	Cases for comparison	Cost (e.g. €200,000)
Year 1	CIVITAS measure	2.857.691.305,64
	Reference case (or BAU)	2.858.573.421,26
Year 2	CIVITAS measure	2.932.360.079,23
	Reference case (or BAU)	2.933.346.263,49
Year 3	CIVITAS measure	3.073.564.732,93
	Reference case (or BAU)	3.074.680.587,41
Year 4	CIVITAS measure	3.201.872.277,85
	Reference case (or BAU)	3.203.117.512,51
Year 5	CIVITAS measure	3.321.565.805,82
	Reference case (or BAU)	3.322.940.723,59
Year 6	CIVITAS measure	3.444.763.673,51
	Reference case (or BAU)	3.446.273.080,82
Year 7	CIVITAS measure	3.571.557.754,50
	Reference case (or BAU)	3.573.206.591,19
Year 8	CIVITAS measure	3.702.042.201,89
	Reference case (or BAU)	3.703.835.544,69
Year 9	CIVITAS measure	3.836.313.502,80
	Reference case (or BAU)	3.838.256.568,91
Year 10	CIVITAS measure	3.974.470.534,04
	Reference case (or BAU)	3.976.568.684,79

C2.5.4 Compare the lifetime costs and benefits

Table C2.5.7 Lifetime cost/benefit of CIVITAS measure (discounted)

	Capital cost	Operation cost	Maintenance costs	Revenues	Costs from journey times	Costs from environmental emissions	Total cost	Total Benefit	Cumulated cost
Year 1	0,00	19.654.389,75	2.274.940,91	18.163.807,65	405.181.175,77	2.857.691.305,64	3.286.769.525,41	18.163.807,65	3.268.605.717,76
Year 2	297.943,78	19.327.400,20	2.237.092,78	20.137.343,33	404.531.296,03	2.833.198.144,19	3.261.564.864,37	19.456.370,36	3.242.108.494,01
Year 3	323.111,78	20.169.174,04	2.334.525,76	20.263.437,94	401.329.412,59	2.869.205.566,46	3.294.212.225,32	18.916.136,14	3.275.296.089,18
Year 4	321.238,78	20.096.744,27	2.326.142,21	21.306.065,03	404.314.825,83	2.887.905.345,49	3.315.995.691,70	19.216.849,94	3.296.778.841,76
Year 5	98.140,46	19.805.487,11	2.292.430,01	21.732.186,33	405.579.050,58	2.894.552.705,27	3.323.563.533,81	18.938.344,87	3.304.625.188,94
Year 6	101.084,67	19.518.451,07	2.259.206,38	22.166.830,06	406.700.316,41	2.900.398.579,27	3.330.191.908,97	18.663.876,10	3.311.528.032,86
Year 7	104.117,21	19.235.574,96	2.226.464,26	22.610.166,66	407.682.907,77	2.905.464.534,46	3.335.906.596,49	18.393.385,15	3.317.513.211,35
Year 8	107.240,73	18.956.798,52	2.194.196,67	23.062.369,99	408.531.007,08	2.909.771.706,75	3.340.732.843,63	18.126.814,35	3.322.606.029,28
Year 9	110.457,95	18.682.062,30	2.162.396,71	23.523.617,39	409.248.696,97	2.913.340.807,30	3.344.695.374,11	17.864.106,89	3.326.831.267,22
Year 10	113.771,69	18.411.307,78	2.131.057,63	23.994.089,74	409.839.962,42	2.916.192.128,88	3.347.818.396,69	17.605.206,79	3.330.213.189,90
Total	1.577.107,06	193.857.390,00	22.438.453,33	216.959.914,12	4.062.938.651,45	28.887.720.823,70	33.181.450.960,50	185.344.898,24	32.996.106.062,26

Table C2.5.8 Lifetime cost/benefit of the reference measure/case (discounted)

	Capital cost	Operation cost	Maintenance costs	Revenues	Costs from journey times	Costs from environmental emissions	Total cost	Total Benefit	Cumulated cost
Year 1	0,00	21.270.105,00	2.626.939,00	16.881.914,01	406.458.061,01	2.858.573.421,26	3.286.960.812,93	16.881.914,01	3.270.078.898,93
Year 2	0,00	21.063.478,26	2.702.393,24	16.601.050,06	405.800.055,12	2.834.150.979,21	3.261.515.527,31	16.601.050,06	3.244.914.477,25
Year 3	0,00	21.028.536,24	2.558.014,81	17.324.082,10	402.581.989,66	2.870.247.228,55	3.295.332.918,01	17.324.082,10	3.278.008.835,90
Year 4	0,00	21.233.129,35	2.456.452,13	17.261.869,38	405.570.432,88	2.889.028.475,81	3.317.021.795,18	17.261.869,38	3.299.759.925,79
Year 5	0,00	20.925.402,84	2.420.851,38	17.011.697,36	406.832.181,36	2.895.750.866,68	3.324.680.965,16	17.011.697,36	3.307.669.267,79
Year 6	0,00	20.622.136,13	2.385.766,58	16.765.151,03	407.950.403,38	2.901.669.459,72	3.331.397.520,56	16.765.151,03	3.314.632.369,53
Year 7	0,00	20.323.264,59	2.351.190,25	16.522.177,82	408.929.409,19	2.906.805.864,17	3.337.197.312,59	16.522.177,82	3.320.675.134,77
Year 8	0,00	20.028.724,52	2.317.115,03	16.282.725,97	409.773.406,17	2.911.181.257,98	3.342.105.659,33	16.282.725,97	3.325.822.933,36
Year 9	0,00	19.738.453,15	2.283.533,65	16.046.744,43	410.486.501,10	2.914.816.394,15	3.346.147.354,27	16.046.744,43	3.330.100.609,83
Year 10	0,00	19.452.388,61	2.250.438,96	15.814.182,92	411.072.702,32	2.917.731.607,07	3.349.346.674,80	15.814.182,92	3.333.532.491,88
Total	0,00	205.685.618,69	24.352.695,02	166.511.595,09	4.075.455.142,19	28.899.955.554,62	33.191.706.540,13	166.511.595,09	33.025.194.945,04

C2.5.5 Summary of CBA results

For the summary of CBA results the changes in benefits and costs between the two scenarios are assessed. Both journey time and emission savings are a benefit resulting from the implementation of the CIVITAS measure, therefore accounted as such in this summary.

The corresponding Net and Cumulative Cash Flow is also considered in the following summary.

Table C2.5.9 Lifetime changes in costs and benefit (discounted)

	Changes in Costs	Changes in benefits	Net cash flow	Cumulative cash flow
Year 1	1.967.713,34	3.440.894,51	1.473.181,17	1.473.181,17
Year 2	2.489.246,91	5.076.914,42	2.587.667,51	4.060.848,68
Year 3	1.384.479,55	3.886.293,20	2.501.813,65	6.562.662,33
Year 4	1.556.433,97	4.333.717,93	2.777.283,96	9.339.946,30
Year 5	1.333.860,84	4.377.939,69	3.044.078,85	12.384.025,15
Year 6	1.315.355,84	4.419.692,50	3.104.336,67	15.488.361,81
Year 7	1.297.115,03	4.459.038,45	3.161.923,42	18.650.285,24
Year 8	1.279.134,62	4.496.038,70	3.216.904,08	21.867.189,32
Year 9	1.261.410,83	4.530.753,44	3.269.342,61	25.136.531,93
Year 10	1.243.939,98	4.563.241,96	3.319.301,98	28.455.833,91
Total	15.128.690,89	43.584.524,80		

The change of Net Present Value of the implementation of HQBC in CTSS-DBUS' fleet is 28,4m€, which means that the NPV of this measure is higher than the one associated to BaU scenario.

The benefit to cost ratio (BCR) is 2,88 which means that benefits are nearly three times larger than costs. This result reveals that the implementation of HQBC is a very cost-effective measure.

C3 Achievement of quantifiable targets and objectives

No.	Target	Rating
1	5% increase of passengers in urban buses, meaning 1 million extra passengers during the last project year as compared to 2006	★★★
2	To reduce the number of cars entering the city centre by 5% compared to 2006 levels.	**NA yet**
3	5% increase in operating revenues as compared to 2006	★
4	Maintain operation and maintenance costs (only increased by inflation)	**O**
5	Achieve a security Index of 7	★★★
6	Achieve a punctuality Index of 90%	★★★
7	Achieve a quality Index of 7	★★★
8	Maximum 10 injuries/month caused by transport accidents	★★
9	Average speed of buses along the corridors of 14 km/h	★★★
10	Average journey time of 27 min and 24 min in lines 28 and 5 respectively	★★★
NA = Not Assessed O = Not Achieved ★ = Substantially achieved (at least 50%) ★★ = Achieved in full ★★★ = Exceeded		

C4 Upscaling of results

There are two ways of up-scaling this measure:

1. Expand UNE EN-13186 quality standards and priority measures to all CTSS-DBUS routes and corridors
2. Applying the measure to other City and Regional bus services

In both cases, higher commercial speeds, more reliable services and increased public perception would be achieved.

If this measure is up-scaled to other secondary corridors, the following goals can be achieved:

- Increase the total number of annual public transport users with 1,5 million extra passengers.
- Increase of the customer satisfaction in the services of the other corridors.
- Reduction of the average journey time of the services of the other corridors.
- Higher average speed of buses in the services of the other corridors.
- Less cars entering in the city along the other corridors.
- More security perception in the services of the other corridors.

While up-scaling this measure to all public transport services in Gipuzkoa region, would result in the following impacts on Donostia-San Sebastian:

- Less cars entering in the city along any of the corridors.
- Increase the total number of annual public transport users that use the modal shift with urban public transport.
- Reduction of the average journey time of all the public transport services.
- Higher average speed of buses in all the public transport services.

C5 Appraisal of evaluation approach

It is considered that the evaluation approach is in concordance with the measure objectives, and data collection procedures adequate. To highlight that the availability of a Bus Management System has eased this task, since most of the system operation indicators are automatically provided by the system.

With this measure as part of a package directed towards the improvement of public transport operation and the increase in bus patronage, the main difficulty was to evaluate the isolated effect of each measure on the overall impact and its perception by the users. Although a survey has been conducted for this particular matter, an in-depth evaluation would require more detailed analysis.

C6 Summary of evaluation results

This measure is part of a package of measures (measures nº 16, 17, 73 and 74) aiming at increasing the quality offered by the public transport service in the municipality of Donostia-San Sebastián, inducing a modal shift toward public transport.

The measure has resulted very successful in this regard, since between 2006 and 2011, there was an increase of 2,55 million extra travellers in CTSS-DBUS's public transport system, which represents a 9,6% increase in the number of users. If compared to the BaU scenario, the improvement in public transport services has resulted in an 8,6% increase in the number of users. It should be highlighted that, according to the surveys conducted, nearly 40% of all new users were former users of the car or motorbike.

From an operational perspective, the improvements in service operation has contributed to achieve an excellent punctuality index of 98,20 on lines 5 & 28. Also, the average speed of buses along the corridors has increased approximately in 2 km/h as compared to the BaU scenario in both lines. Accordingly, the average journey time has experienced a significant reduction of more than 3 minutes.

The improved operation has been perceived by the users, whose perceived quality of service has significantly increased, from an index of 7,3 in 2006 to 7,6 in the surveys carried out after the measure was fully implemented. In this regard, it should be noted that the public perception survey conducted among users has revealed that effectiveness issues (punctuality, reduced journey times,...) are perceived as very important, with an average score of 8,79 in 2011.

On the other hand this package of measures is part of an overall strategy to reduce the number of cars entering the city and circulating within its neighbourhoods. In this regard, the implementation of the BRT lines along the CIVITAS high quality public transport corridors has contributed to a reduction in the number of cars entering to the CIVITAS corridor, which has been accounted in more than 7.500 cars per day.

Overall, this situation has provided significant benefits in the form of better air quality and less carbon emissions, resulting in a better health and quality of life for Donostia-San Sebastian citizens.

Also the revenues from public transport usage have increased due to the implementation of the measure. Compared to the BaU situation, the high quality public transport corridors have increased CTSS-DBUS' revenues by more than 515.000€ in 2011.

Finally, in terms of benefits and costs, the benefit to cost ratio (BCR) is 2,88 which means that benefits are nearly three times larger than costs. This result reveals that the implementation of HQBC is a very cost-effective measure.

C7 Future activities relating to the measure

In the following years CTSS-DBUS will work to extend HQBC standards to other lines. In particular:

- Service frequency will be improved in other lines
- Articulated buses will be introduced in other routes
- The bus lane network will be extended to other corridors
- Priority measures will be implemented at other junctions

D Process Evaluation Findings

D0 Focused measure

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

D1 Deviations from the original plan

The deviations from the original plan comprised:

- **Deviation 1 Economy indicators 1, 2a, 2b** – Instead of using the unit "€/pkm" to calculate the costs indicators, "€/km" unit have been used. With this unit, this indicator is easier to use, as well as eases the dissemination of results.
- **Deviation 2 Environment indicators 8, 9, 10, 11** – Instead of using the units "G/vkm" to calculate the emissions indicators, "Tm" units will be used, that is more precise.

D2 Barriers and drivers

D2.1 Barriers

The main barriers encountered for the development of measure 16 are:

Preparation phase

- **Cultural:** the extended car culture, with car as the usual mode of transport for those who can afford it acts as a barrier to the attraction of new customers and modal shift (drivers to public transport)
- **Financial:** priority measures (both infrastructural and technological) are very expensive.

Implementation phase

- **Spatial:** The topography of Donostia-San Sebastián, with many urban areas in hilly territories, makes more difficult the planning of transport corridors and the intermodality between modes.

Operation phase

- **Institutional:** With a significant number of commuters travelling to Donostia from metropolitan areas, the lack of integration of metropolitan public transport services within the DBUS system acts as a barrier for an increased use of public transport.
- **Political/Strategic:** Although significant improvements of the public transport system are taking place over the last years, encouraging its use, recent decisions regarding the parking policy in the city, with mass storage parking infrastructure

being built in the city centre, may counteract with public transport objectives, attracting users to drive their cars towards the city centre

D2.2 Drivers

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

Preparation phase

- **Political/Strategic:** There is a clear commitment from policy makers in Donostia-San Sebastian to promote the development of the public transport system in the city, allocating technical resources and funds to this task.
- **Cultural:** Signs of a new mobility culture, in which sustainable modes are preferred over car use, are emerging among Donostia-San Sebastian citizens. This situation is easing the adoption of measures to promote public transport in the city

Implementation phase

- **Financial:** The availability of CIVITAS funding has been a significant opportunity to develop these measures.
- **Organizational:** Over the last years a better integration of urban planning with public transport needs has eased its development, improving its operation, thus making it more attractive to users

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

- **Cultural:** New channels to connect with the community of users have been developed: web forum, Facebook group, Twitter, periodical user's satisfaction survey….

Implementation phase

- **Organizational:** Continuing with the process of improving the management of all dimensions of public transport service, the line 28 received the AENOR quality certification UNE-EN 13816. This certification implied a set of improvements in security, commodity, accessibility, good driving, environmental impact, information and user interactivity with company.
- **Technological:** Aware that users satisfaction mostly depends on commercial speed and reliability, new priority measures including infrastructural developments (bus lanes) and priority at traffic lights have been implemented

- **Operation phase**
  - **Positional:** the implementation of the measure has been complemented by improved user information measures and an enhanced bus management system. As well as the optimization of the bus routes and services.

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:

- **CTSS-DBUS Traffic & Planning Department -** Development and implementation of the bus services for the High Quality Public Transport Corridors. Responsible of the installation of the security cameras in buses of the two CIVITAS corridors. Leading role.
- **DSS Municipality Public Works Department –** Infrastructural changes and-or changes in the public space at bus stops areas. Principal participant.
- **DSS Municipality Mobility Department –** Implementation of priority measures at intersections involving changes in traffic lights management. Principal role.

D.3.2 Stakeholders

The main stakeholders involved in the measure are:

- **AENOR (Spanish quality certification and normalization company) -** UNE EN-13816 quality standard certifying body
- **PROINTEC-INDRA -** Security cameras and information technology providers. Priority measures technology.

D4 Recommendations

D.4.1 Recommendations: measure replication

- **Planning:** Public transport improvements must be complemented by car traffic restriction measures, especially parking policy.
- **Support measures:** A centralized mobility centre may be very helpful in developing promotion and awareness activities and information campaigns.
- **Full scope of the measure:** Integrated quality of public transport services also from the accessibility to bus stops side, as well as in the quality of waiting areas, should be addressed

D.4.2 Recommendations: process

- **Planning**: Emphasize integrated planning with other city departments and territorial transport planning and management bodies (Diputación de Bizkaia, Basque Government,…).
- **Publicity**: In spite of considering it a mere internal management related issue, is recommended that the quality certification of bus lines are given a significant publicity, sharing it with the population and the media. On the one hand, it raise awareness on

the commitment of the bus company to optimise quality of service, while additionally creating a sense of pride regarding the bus service in the city.

- **Corporate image**: it is recommended that a substantial change in service provision is accompanied by changes in the corporate image of the company in order to emphasise the idea of a renewed stage in public transport service provision.

E Summary time schedule

Task No.	Task name	YEAR 1												YEAR 2												YEAR 3												YEAR 4												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
11.2.1	Technical Development of High Quality Transport Corridors												XE1																	E2													E3							
2.10	High Quality Public Transport Corridors												PE1						X											E2													E3							
Evaluation tasks																																																	
Workshop for process evaluation																			X											X													X							
Process evaluation report																				X												X												X						
Deliverables																																																	
M12.1 Draft MLEP									X																																								
D12.1 Final MLEP																										X																							
D12.2 Baseline and first results Temp																																X																		
D12.3 Draft results Temp																																													X				
D12.4 Final result temp																																																	X