

**CiViTAS**  
Cleaner and better transport in cities

**MIMOSA**

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## Measure Evaluation Results

### FUN 2.1 Green PT Line

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Date: February 2013



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IS CO-FINANCED BY THE  
EUROPEAN UNION

## Executive Summary

During the previous years the waterfront area in the West part of Funchal has been developed and became an attractive residential and tourist area. New leisure areas were built which contributed to the good reputation of the area and made it one of the most pleasant areas in the entire island. Nevertheless, the increase of visitors in this area implied a rise in traffic. The MIMOSA measure 'Green PT Line' aimed at creating a bus line to supply this tourist and residential area with a well-planned high-performance service. The objective of the measure is to encourage residents and tourists to use public transport (PT) instead of taxis or private cars in the target area which is one of the most significant urban areas in Funchal.

The measure was implemented in the following stages:

**Stage 1: Launch of the Green Line Pilot test** (September 2009) A new bus line called "Green Line" opened to the public with the aim at offering a cleaner transport system connecting the historical city centre with the west seaside area of the city where over 50 hotels are located. "Euro V" buses drive along this 6 km long corridor. To promote the new line the Municipality of Funchal conducted a communication campaign with a focus on both tourists and residents. Therefore meetings were organized targeting hotel managers and information was distributed to residents of the target area to encourage them to use the new bus line.

**Stage 2: Launch of the Green Line in its second version** (January 2010) The PT network was streamlined in the West part of the city and its time-schedule was reshaped in order to match the offer to the demand. Although the integration of the Green Line into the existing network has provided an additional PT service, these changes affected residents of some peripheral areas negatively who lost their direct bus connection to the city centre.

**Stage 3: Launch of the Green Line in its final version** (January 2011) The negative effects of the Green Line for the residents of some peripheral areas led the PT operator and the Municipality to adapt the Green Line in the frame of the third and final phase of the measure implementation. The initial main Green line was split in three lines with different final stops in the peripheral areas and common road sections in the city centre and with different departure/arrival time schedule in the city centre in order to ensure a fairly efficient PT service. Besides the reshaping of the network, new facilities have been installed: for instance, the amount of seating accommodation at the bus stops increased from 26% to 78% between 2008 and 2012, whilst the number of bus stops equipped with shelters was raised from 57% to 89% after the measure implementation. At the same time, the new PT ticket (called "Tourist Kit") was established to incentive visitors to use public transport. A total of 19 hotels joined and sold 5.022 tourist kits in 2011.

Since the measure fit very well with the five pillars of the EU Green Paper for urban mobility (free-flowing, greener, smarter, accessible and safe & secure urban transport), the measure was selected as a **focused measure** in the frame of the MIMOSA project. Additional to the impact and process evaluations of the measure, a Cost-Benefit Analysis (CBA) was conducted to evaluate the efficiency of the new introduced ticket "Tourist Kit". The impact evaluation was based on administrative calculation (of operational revenues and costs before and after measure implementation, as well as number of wheelchair users, hotel cooperation with the Tourist Kit and number of accidents involving PT buses); estimation of pollutants

emitted from bus operations (using COPERT software), on-board surveys to Green Line passengers to evaluate perceived quality of service and off-board surveys to citizens to quantify acceptance; and on-street counting of vehicles to analyse meaningful differences with regard to traffic levels. To evaluate the impact on the entire PT network, a set of eight selected bus lines which operate in the focused area was selected and deeply analysed.

The impact evaluation results of the Green PT Line were positive and the outcomes of the measure were already visible during the lifetime of the implementation. **Several key results** from the evaluation showed the evolution between 2008 (before the implementation of the Green Line) and 2011 (after the implementation). First, the streamlining of the network led to a decrease of 25% in operating costs between 2008 and 2011. Secondly, pollutant emissions caused by buses in the target area decreased by 43% in PM10 and by 13% in CO<sub>2</sub> due to the decrease of kilometres driven by buses after the network reorganization and due to the use of Euro V buses along the Green line which are more energy efficient. Thirdly, the number of accidents in the target area involving buses has decreased by 30% (also influenced by a general decrease in traffic flows within the area). Fourthly, the implementation of the Green Line is perceived as useful or even very useful among interviewed commuters.

Considering 2015 horizon and the scenario in which tourists will use PT system by buying the “Tourist Kit” ticket to access the city centre instead of using the free hotel courtesy services, **the CBA showed** that the financial benefit produced by the Tourist Kit will be economically attractive, equalling to nearly 7 Million Euros and a half.

**The main barrier** encountered during the measure implementation was the current informal business arrangements between hotels, taxi companies and tourist operators which undermined the efforts undertaken to persuade tourists to use PT modes. **The main driver** that smoothed the decision-making process was the high degree of involvement of the Regional Government in transport affairs. Among other promotional activities, the Regional Government sponsored a green mobility award to recognize efforts made by some hotels in promoting the Tourist Kit. This award raised awareness towards sustainable mobility actions such as the Green Line.

The Tourist Kit had been proved to be efficient and the results highlighted that this ticket is an incentive which is **appropriate for cities with high rate of tourism and easily replicable**. Indeed, if the PT connection between the airports/main stations and the tourist areas already exist, a special public transport ticket for tourists will incentivise them to use PT instead of taxi to reach their hotels.

The Green Line is a long-term agenda-setting measure, which is jointly understood by both the PT Operator and the Municipality as a significant step to enhance the PT facilities. The MIMOSA measure contributed to launch concrete activities and stimulate stakeholders to closely cooperate towards a sustainable mobility system for Funchal.

## A Introduction

### A1 Objectives

The measure objectives are the following:

(A) High level / longer term:

- Improvement of quality of life;
- Reduction in transport-related emissions;
- Increase modal share of sustainable modes.

(B) Strategic level:

- PT service quality is a key element in obtaining high levels of satisfaction among both tourists and residents. In areas with high levels of traffic, this task offers an even bigger challenge. This is why it is important to improve PT services on a key corridor with high levels of traffic so as to determine the potential sustainability aspects for both tourists and residents.
- To find the right partners to make local public transport increasingly *user friendly*.

(C) Measure level:

1. Meet the growing demand for the mobility of citizens and tourists, aimed at substituting a significant number of hotel shuttle services in the western part of the city, known as the tourist area of Funchal, by means of marketing approaches to hotel managers;
2. Raise the acceptance of citizens with public service and improve the overall image of public transport in the urban area, by promoting an attractive and high quality local public transport service (LPT), with strict safe requisites, quality, information, accessibility and environmental standards;
3. Reduction in use of private car in target area through the promotion of LPT.

### A2 Description

Green PT Line was planned to have a demonstration role for hybrid/electrical vehicles, but it was not possible to go through with it and purchase this kind of buses due to technical limitations. So Euro V buses already bought before CIVITAS were exclusively assigned to this bus corridor.

As PT operator is responsible for the service and the local Municipality for street design, traffic management and bus stop layout, integrated actions between the PT operator and the Municipality, have been necessary aiming to increase the PT usage by locals and tourists alike.

Another important activity implemented was the Tourist Kit, which gives the opportunity to the tourists to receive a public transport ticket in the hotel. This package has started as an auxiliary action to support the Green Line and promote public transport in hotels. But it turned out to be one of the most important and more interesting features of this measure, creating breakthroughs in terms of nurturing green and responsible mobility habits.

Figure A2.1: Tailored decoration for Green Line



The Tourist Kit action is in line with the recently published European Action Plan for Urban Mobility (COM, 2009, 490), a document where the Commission stresses the importance of public-private partnerships.

This measure has developed along three phases. Stepwise, the third phase of the Green Line was not planned at the very beginning but it was felt necessary because on the former phase some public transport commuters lost a direct connection to their homes. Consequently, the Green Line was split into three lines, with decent levels of frequency, supplied by Euro V buses and with nearly all bus stops subject to improvements. Moreover, communication with residents and tourists also got better owing to the multimedia kiosks installed on-street and due to several communication campaigns that were carried out.

## B Measure Implementation

### B1 Innovative Aspects

- **Targeting specific user groups, within EU** – This measure tests the effect of a high quality PT service in a tourist area. Therefore, tourists widely benefit from this demonstration and the region also improves its image.
- **New organizational arrangements or relationships, internationally** – Hotel managers, the PT operator and the Municipality are involved in a synergetic partnership.
- **New mode of transport exploited, regionally** – For the first time in Funchal, this measure aids to integrate a unique scheme for bicycle use with bus, due to meaningful liaison with Bus and Bike (the Green Line buses carry bicycles with bike racks);
- **New physical infrastructure solutions, nationally** – New bus stops were built, enabling easier access for disabled people.

### B2 Research and Technology Development

The Green Line measure is, above all, an implementation measure built upon RTD efforts. In this process a number of available feasibility studies were consulted to understand and deploy the technical building blocks necessary to the success of the measure. The R&D activities developed in the frame of Green Line measure have resulted in some findings, which can be split into four main topics:

#### ***i) Hotel Managers and courtesy buses***

The majority of the hotels of Funchal are located within the Green Line catchment area. There is a total number of 47 hotels along the main road (all of them are located on a 4 km street) that stretches across the western sea-front of the city. Furthermore, it is important to note that this area is rapidly growing in terms of residents, especially wealthy citizens. The introduction of a high quality PT service is, hence, a tool to manage the area and the masses of individuals who travel from and to this area, steering them towards a sustainable choice of modes.

Studies that Tourism Regional Government periodically conducted (namely, *Estudo do Perfil do Turista* (2002); *Estudo sobre o Gasto Turístico na Madeira* (2004); *A Madeira vista do Continente* (2006) were summarized and lessons extracted in terms of urban transport related issues, some of which were instrumental to prepare Tourist Kit.

This R&D was thus also instrumental to realize that tourists have some difficulties accessing information on the service and understanding the public transportation network in Funchal. Even though many of Funchal' roads are much more than mere transport axes, as they wind their way through beautiful cliffs, offer fantastic views and provide access to historical landmarks, tourists remain a category of PT users still relatively unknown.

This is why the evaluation activities have sought to develop surveys and commercial proposals to persuade a growing number of tourists to use the public service. Moreover, it was necessary to foster new information tools through a Tourist Kit, designed by the PT Company, with the specific Green Line brand, which includes exhaustive information in a single booklet. This is a win-win initiative since both parts can potentially take advantage from a deal that hopefully will increase tourist satisfaction.



### ***ii) Public transport supply in the target area***

The Western part of the city is a living example of overlapping services, with several lines operating simultaneously creating inevitable over-costs for fuel and maintenance. These externalities are at the core of this reorganization. The R&D studies carried out within the measure have outlined features such as pointless kilometres and low occupation rates (between 12% and 34% in the target area) in the catchment area.

### ***iii) Introduction of cutting-edge vehicles***

To make sure that PT service fulfils the required quality standards, the PT Operator has sought to study the topography of the catchment area to understand if it was feasible to assign Euro V buses only to this area and to launch a tender process to purchase electric and/or hybrid buses to circulate in the target area. The analysis showed that proposals hardly suit the specifications required in the tender process, so it was not possible to deploy electric or hybrid buses, though Euro V buses suit the area perfectly.

### ***iv) Support actions to enhance PT***

To achieve high security levels the PT Company analysed safety, comfort and visibility of current bus stops. This analysis helped to determine which bus stops needed improvements. The Municipality has endorsed actions to support full implementation of the measure, namely those that can enhance PT over private transport, such as: creation of new shelters, improvement of accessibility to public transport, mainly by the elderly and disabled citizens.

## **B3 Situation before CIVITAS**

The target area is the suburb of São Martinho, a tourist zone where most hotels are concentrated. Transportation from the hotels to the centre is provided by 12 private buses responsible for annually performing over 200.000 km a year, which create high levels of congestion, especially in the city centre. This courtesy service can be considered as inefficient because it is totally overlapped by regular PT routes.

The Urban Mobility Study for the city Council (2007) has considered that this area suffers some of the highest congestion levels in Funchal. So the new PT line was a priority action to grant acceptable commercial speeds and a high quality of service. Local authorities saw in MIMOSA, and the Green Line measure in particular, an essential management tool to foster PT enhancement through marketing campaigns and specific traffic improvements, facilitating Public Transport accessibility and intermodality.

At a local level, this measure equally supported the Monumental Restyling Project, named after the main street that spreads along the coast where most hotels are located. Monumental Restyling is an initiative developed a couple of years before CIVITAS, that pursues the liveability and life quality in this strategic area, aimed at creating the ideal conditions for residents and tourists to enjoy the pleasures of walking, cycling, playing or just diving into the sea. Hence, the municipality very strongly supports this measure, promoting this project also to hotel managers, since tourists generate a relevant number of trips every day.

## **B4 Actual Implementation of the Measure**

This measure was implemented in the following stages:

**Stage 1:** (From 9<sup>th</sup> of September to 21<sup>th</sup> of September, 2009) – Preparation of the measure and communication kick off

- On 9<sup>th</sup> of September, the Municipality held a meeting with hotel managers to inform them of the local mobility strategy for the area where their hotels are located on the one hand, and to promote the public transport operator 'Horários do Funchal's (HF) Tourist Kit, a new commercial agreement for tourists, on the other hand. The meeting was a success especially since it helped to clarify the role of the hotel managers in the Municipality and PT Operator vision for the mobility framework in the area where their hotels are located. 46 hotel units were contacted, 24 attended the meeting (13 of these hotels had courtesy bus). So the commercial approach to incentivise tourists using the bus was planned from the very R&D phase of the measure as described in section B2.
- Following the meeting, the communication campaign began. From the 17<sup>th</sup> of September to 21<sup>st</sup> of September, 300 letters were strategically delivered in the mail box of the households located along the Green Line target area. Cars parked in this area received 300 flyers with brief information about the new service to encourage car owners to change their mobility routines towards more sustainable mobility habits. The communication campaign also prepared the ground for the installation of 3 multimedia kiosks along the Green Line corridor with bi-lingual information to assist pedestrians in finding their way to the most convenient route and bus stop according to where they wish to travel.

**Stage 2:** (September, 2009) Launch of the Green Line Pilot test (*phase 1 of measure implementation*)

- On 22<sup>nd</sup> of September, 2009, the first phase of Green Line measure was launched, including the official opening of both the new route and new bus shelters. This was a transition point for Green Line, as it marked the beginning of the new service.
- On 23<sup>rd</sup> of November, the Monumental Lido hotel (4 star hotel) signed a commercial agreement with HF. From this day forward, they started to sell and publicize PT as the best transport option for the mobility needs of the tourists who stay with them. This hotel, however, did not have a courtesy bus, so it was to their advantage to take part in the service.

**Stage 3:** (January, 2010) Launch of the Green Line in its second version (*phase 2 of measure implementation*)

- The public transport network was streamlined in the West part of the city and PT landscape was reshaped. In this phase, PT operator also changed the schedules for all PT lines, slightly reducing the frequency, due to the general decrease in numbers of passengers transported.

**Stage 4:** (January, 2011) Launch of the Green Line in its final version (*phase 3 of measure implementation*)

- Besides the high interest in the new Green Line, mainly by tourists and hotel managers, the users of the other lines that had been changed and no longer connected directly with city centre, made a lot of complains. Even though the objective of this 2<sup>nd</sup> phase was to provide more mobility solutions to locals, they didn't accept the necessity to shift from one bus to another. Considering this, and after a complete analysis of the entire urban public transport network, HF decided to change



the service design in the area to minimize disturbance among people who used to have direct access to the city centre. This final and current version of the Green Line was not planned in the beginning, but it was necessary to overcome the inconvenience perceived by locals. Thus, currently the Green Line is composed of three lines with different destinations, partially overlapping in terms of route, but with different departure times in the city centre, ensuring a fairly efficient service.

To aid understanding, in annexes from II to V one is able to find network maps for the West part of the city before the measure implementation and the evolvments of all three *implementation phases*.

## B5 Inter-Relationships with Other Measures

The measure shares some synergies with other CIVITAS measures as follows:

- **Measure FUN 2.3** – The measure Public Urban Transport Planning Centre is connected with Green Line, especially if taking into account that the planning centre was partially responsible for the reorganization of some bus lines and service in the target area.
- **Measure FUN 2.4** – One of the new Park and Ride (P&R) facility created in the frame of MIMOSA project is located within the Green Line catchment area. So one should expect that traffic flow can be lower due to the effects of this package of actions in the area.
- **Measure FUN 6.1** – Green Line is supplied by Euro V buses only. These buses were driven by drivers that were subject to monitoring/training in the frame of Eco Driving measure so a decrease in fuel consumption and a less aggressive driving style should be expected to show up during 2011.
- **Measure FUN 6.2** – Green Line had a close relationship during the implementation phase with measure Bus and Bike. The success of the Bus and Bike measure strongly depends on the Green Line, because the bicycle lane was implemented along the Green Line target area. But also Bus and Bike has potential to strengthen Green Line by increasing PT use. Together, they synthesise and represent the backbone of sustainable development in Funchal regarding urban mobility.

Besides CIVITAS, this measure welcomed cross-fertilization synergies with one ERDF project, called “Mobilidade Inovadora no Funchal” (Innovative Mobility in Funchal), which supported financially the purchase of the Tourist Kit materials.

## C Impact Evaluation Findings

### C1 Measurement Methodology

#### C1.1 Impacts and Indicators

It's important to point out firstly that Green Line was granted a focus measure status, as it involves a big number of stakeholders (tourists, services, residents and non-residents that live and/or work in Funchal or even those who travel to this area to leisure activities). Therefore, this measure was certainly worthy of an in-depth approach. The comments and recommendations that Funchal site were able to identify following full implementation of Green Line are certainly a reference to transfer this measure to other cities across Europe as one will be able to understand further below in the document.

This measure also fits very well under local mobility policy, since the target area is a wide ground that spreads along a highly strategic area, essential to the urban equilibrium, where the vast majority of tourist infra-structures are located. This measure aims to eliminate the overlapping public transport lines that supply this area and has the strategic objective of improving the environmental quality of this corridor, lowering the provision of hotel shuttles. For this, the local policies have been promoting this measure as an icon of the city policy for the mobility in Funchal.

In the following, we present an overview of the indicators used to analyse the impact this measure has had. Some indicators are sounder as they relate with POINTER core indicators, others are specific design for this measure and are thus considered to be city specific indicators. Moreover, there are indicators that even though they are important to have proper and sufficient insight into this measure, they were not evaluated for one reason or another described further below.

A methodological remark should be made: for convenience reasons, we assume that the network streamline has impacted on 8 routes, and these routes will hence be subject to evaluation.

Green Line was a flagship event of 2009 European Mobility Week edition in Funchal. This means that it was first implemented (phase 1) in September 2009. Baseline data thus should be collected prior to this period as one summarizes below:

**Table C1.1.1.:** *Specific impact indicators related with Green Line focused measure*

Evaluation category	Evaluation sub-category	Impact	Indicator	Description and Source of data	Success quantification	Baseline	After Data collection
Economy	Revenues	Operating revenues	1 - Operating revenues (POINTER core indicator 1)	<b>Data unit:</b> € (per year) <b>Source:</b> PT Operator	Increase operating revenues in at least 2%	2008	2011
		Operating costs	2 - Operating costs (POINTER core indicator 2B)	<b>Data unit:</b> € (per year) <b>Source:</b> PT Operator	Decrease operating costs in at least 2%	2008	2011

Evaluation category	Evaluation sub-category	Impact	Indicator	Description and Source of data	Success quantification	Baseline	After Data collection
Environment	Pollution / Nuisance	Emissions	3 - NOx emissions (on buses that circulate on the target area) (POINTER core indicator 6)	<b>Data unit:</b> tones (per year) <b>Source:</b> The Municipality outsource the environment evaluation to a company named OCCAM	Final goal: reduce NOx emission levels by 2%, at least, when comparing to baseline measurements	2008	2011
			4 – CO2 emissions (on buses that circulate on the target area) (POINTER core indicator 8)		Final goal: reduce CO2 emission levels by 2%, at least, when comparing to baseline measurements		
			5 - PM10 emissions (on buses that circulate on the target area) (POINTER core indicator 11)		Final goal: reduce PM10 emission levels by 2%, at least, when comparing to baseline measurements		
Transport	Quality of Service	Quality of service	6 - Quality of service (POINTER core indicator 19)	<b>Data unit:</b> Index, qualitative, collected, survey <b>Source:</b> PT Operator and Municipality (through the OCCAM consultancy and data collected for the Urban Mobility Study)	Grow perception of quality of service in at least 5%	2007	February, 2011
	Transport System	PT users	7 - Number of PT users (City specific indicator)	<b>Data unit:</b> Counting, quantitative (year) <b>Source:</b> PT Operator	Increase the number of PT users in the target area in at least 5%	2008	2011
		Safety	8 - Number of PT related accidents in target area (City specific indicator)	<b>Data unit:</b> N°/100.000Km, quantitative, collected, measurements <b>Source:</b> PT Operator	Decrease the n° of PT related accidents in target area	2008	2011
		Traffic level	9 – Traffic level (POINTER core indicator 21)	<b>Data unit:</b> N° of vehicles <b>Source:</b> PT Operator and CMF both have the responsibility to collect this data by regular campaigns to count vehicles.	Reduce traffic congestion in the catchment area, at least, 5%	October, 2006	February, 2012

Evaluation category	Evaluation sub-category	Impact	Indicator	Description and Source of data	Success quantification	Baseline	After Data collection
Society	Acceptance level	Acceptance	10 - Hotel adhesion (City specific indicator)	<b>Data unit:</b> % of hotels that support the measure out of total located in the area. <b>Source:</b> PT Operator	Achieve the hotel support of, at least, 20% of the total hotels located in the target area.	2008	June, 2012
			11 - Measure acceptance level (POINTER core indicator 14)	<b>Data unit:</b> %, survey, to understand the usefulness level of a measure <b>Source:</b> PT Operator and Municipality	Register a positive and growing percentage of citizens who favourably receive or approve a measure	N/a	July, 2011
	Accessibility	Spatial Accessibility	12 – Number of spatial equipment/layout in target area bus stops (City specific indicator)	<b>Data unit:</b> % of bus stop with special equipment/layout installed/design, quantitative, collected. <b>Source:</b> PT Operator and Municipality	Increase level of special equipment on target area by 5%	2008	2012
		Spatial Accessibility	13 - Number of wheelchair users (City specific indicator)	<b>Data unit:</b> No. of disable people who use service, quantitative, collected. <b>Source:</b> PT Operator	<ul style="list-style-type: none"> <li>Promote social inclusion by granting a responsive service open to mobility impaired citizens (growing increase in the number of wheelchair users). At least 200 transported per year</li> </ul>	2008	2011

### **Detailed description of the indicator methodologies:**

**1 - Operating revenues:** This indicator is intended to show the expected economical sustainability of the measure. This indicator results from the multiplication of the number of PT users on the relevant bus routes by the average revenue per passenger of the entire Funchal regular bus service network. **This indicator is not directly linked with these measure specific objectives, but it is instrumental for them** showing if it is affordable to maintain such a project beyond CIVITAS-MIMOSA.

**2 - Operating costs:** This indicator is intended to show the expected economical sustainability of the measure. This indicator results from multiplying the number of PT kilometres travelled by the relevant bus routes by the average cost per kilometre of the entire Funchal regular bus service network. Operating costs entail the overall costs of public transport, in which fuel, maintenance and personnel are the most meaningful. **This indicator is not directly linked with these measure specific objectives, but it is instrumental for** showing if it is affordable to maintain such a project beyond CIVITAS-MIMOSA

**3 - NOx emission levels per km or by passenger transported in PT (on buses that circulate on the target area)** Data was calculated with COPERT, by experts from energy and environment assessment (OCCAM). **This indicator corresponds to the specific objective 2.**

**4 – CO2 emission levels per km or by passenger transported in PT (on buses that circulate on the target area)** Data was calculated with COPERT, by experts from energy

and environment assessment (OCCAM). **This indicator corresponds to the specific objective 2.**

**5 - PM10 emission levels per km or by passenger transported in PT (on buses that circulate on the target area)** Data was calculated with COPERT, by experts from energy and environment assessment (OCCAM). **This indicator corresponds to the specific objective 2.**

**6 - Quality of service:** This indicator results from answers regarding global quality of public transport (“How satisfied are you with Local Public Transport?” in a 1 to 5 scale, being 1 very unsatisfied and 5 very satisfied) to a sample of people who use PT in the catchment area. For the realization of the Mobility Study for the Municipality of Funchal (EMF2007), household and telephone surveys were conducted with both residents and non residents. In total, 2.604 surveys were completed, 28 of which are residents and PT users in the green line area. In 2010 the survey was conducted in the frame of a motivational study with a sample of PT users developed within the Ad Personam project (founded by Energy Cités), 114 of which are users of the bus lines related with this measure. In 2012 data was extracted from a survey conducted by OCCAM on a sample of 187 PT users. The question was: “Taking into consideration the last 6 months, please classify your satisfaction rate with regard to PT in a 1 to 10 scale (1 being highly unsatisfied and 10 highly satisfied)”. **This indicator corresponds to the specific objective 2.**

**7 - Number of PT users:** This indicator corresponds to the number of PT users in the bus lines related with this measure, and the data is collected by the PT operator ticketing system. **This indicator corresponds to all the specific objectives.**

**8 - Number of PT related accidents in target area:** This indicator is collected by the safety department of PT operator. all the accidents associated with the bus lines related with this measure were considered. Data is collected and presented in an annual series. **This indicator corresponds to the specific objective 2.**

**9 - Traffic level:** This indicator results from in situ campaigns to count vehicles in five spots throughout Funchal. Three of these spots are located within the measure catchment area and will hence be used for evaluating the impact of the measure. These campaigns<sup>1</sup> were undertaken at peak hours (from 7 a.m. to 9 a.m. from Noon to 2 p.m. and during the afternoon, from 5 p.m. till 8 p.m.) in 2006 in the frame of the Municipality Mobility Study, in 2009 with Municipality own resources and in 2011 and 2012 by OCCAM. **This indicator corresponds to the specific objective 3.**

**10 - Hotel adhesion:** This indicator corresponds to the number of hotel adhesion (hotels that sign a protocol with the PT operator to sell or give PT tickets to their customers). In addition to this, the total n<sup>o</sup> of courtesy buses circulating in the area, the number of km travelled by courtesy buses and the n<sup>o</sup> of passengers travelling in courtesy buses were identified according to data collected by the Municipality. **This indicator corresponds to the specific objective 1.**

**11 - Measure acceptance level:** This indicator is measured through specific surveys conducted during a relevant event in which CIVITAS-MIMOSA was promoted, Expo Madeira, both in 2010 and in 2011. People were asked if they feel Green Line as useful for themselves. The target of this survey is those who live and work in Funchal. In the 2011 survey, we added a question asking people (both living and working in Funchal) if they had

<sup>1</sup> In 2006, on situ campaign was carried out on the 26/10/2006, 27/10/2006 and 31/10/2006; in 2009 on the 15/10/2009 and on the 16/10/2009; in 2010, it was conducted in 17/03/2011 and on the 18/03/2011. In 2012 on the 09/02/2012 and on the 10/02/2012.

heard about the Green Line to check the effectiveness of the communication campaigns. **This indicator corresponds to the specific objective 2.**

**12 – Number of spatial equipment/layout in target area bus stops:** This indicator corresponds to the percentage of the bus stops located along the Green Line main corridor which were subject to improvements with new equipment/design. Data collection consists of counting. **This indicator corresponds to the specific objective 2.** This indicator is totally tangible and should not be confused as a core outcome because it is rather an output. Yet it is important to add it here to distinguish its contribution to improving quality of service since specific interventions were made to improve the bus stops along the Green Line corridor. Ideally one would ask people how they feel about these improvements, but it was not possible to do so.

**13 - Number of mobility-impaired users:** This indicator corresponds to the number of PT users in the bus lines related with this measure that actually use wheelchair. This data is collected by the bus drivers which register in a sheet the bus stop where the passenger has boarded, where the passenger left, the hour/day and the route number<sup>2</sup>. Data is collected and presented in an annual series. **This indicator corresponds to the specific objective 2.**

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<sup>2</sup> Obviously, sometimes, bus drivers might be too busy to register all the passengers in these conditions so data collected is not 100% accurate.



### List of potential effects that were not accessed

Funchal considers very important to think and discuss all possible effects a measure can have. In this light, brainstorming was conducted on the impacts, coupling all agents related with the implementation of the measures, which resulted in the list presented below:

**Table C1.1.2: List of potential effects that were not accessed**

Impacts category	Indicator	How does it impact	Why it was not accessed
Environment	Average and peak noise	Traffic is the most important cause of noise in this measure's catchment area so one should expect a reduction in its parameters.	Due to delays in the tender process for the environment and energy consultancy process, the first campaign was only carried out when the Green Line was already in its 2 <sup>nd</sup> phase. So no baseline was collected and therefore presented in this document. Also the change of noise levels cannot be attributed clearly to this measure alone so the cost of measuring noise would outweigh the benefits
Society	Noise perception	Noise perception could have decreased due to measure implementation.	The impact this measure could have in noise perception would not be meaningful and noise perception is very subjective.
	Better information about PT	The use of electronic kiosks on street could provide better information to PT users.	Late implementation of the activity leads to a poor impact during CIVITAS lifetime. Moreover, no technical tool to calculate the number of people accessing the multimedia kiosks was available.
	Modal Split of Tourists	The tourist kit could change the tourists' mobility habits.	The access of this information was not planned before the implementation of this activity.
Transport	Average PT buses speed in urban network (in peak and off peak hours)	Less congestion due to the achievement of meaningful modal shifts towards public transport can led to less congestion and raises the average PT speed.	Due to the different paths of the PT routes involved in this measure it would be hard to identify the direct impact this measure has had on this indicator. Plus, it is not a major objective of Green Line.
	People's perception about the new bus stops facilities	Citizens should gladly benefit from the improved conditions offered by bus stops in the area.	The consultancy company of the Municipality ought to collect this information but unfortunately have not provided any data about it.

## C1.2 Establishing a Baseline

The information regarding when and how the baseline was collected/measured is duly described above in table *Table C1.1.1*.

## C1.3 Building the Business-As-Usual Scenario

**Table C1.3.1: BAU assumptions for each indicator**

Indicator	BAU assumptions
1 - Operating revenues (POINTER core indicator 1)	<ul style="list-style-type: none"> <li>BAU will rely on a linear trend line for the 2009-2012 period considering data collected in 2005 and 2008 (prior to Green Line implementation).</li> </ul>
2 - Operating costs (POINTER core indicator 2B)	<ul style="list-style-type: none"> <li>BAU will rely on a linear trend line for the 2009-2012 period considering data collected in 2005 and 2008 (prior to Green Line implementation).</li> </ul>
3 - NOx emissions (on buses that circulate on the target area) (POINTER core indicator 6)	<ul style="list-style-type: none"> <li>BAU considers that the same typology of buses would continue to run on the catchment area, and the kilometres would be the same as in 2008. So in 2011 non Euro V buses would continue to circulate in the area the same mileage than before.</li> </ul>
4 - CO2 emissions (on buses that circulate on the target area) (POINTER core indicator 8)	
5 - PM10 emissions (on buses that circulate on the target area) (POINTER core indicator 11)	
6 - Quality of service (POINTER core indicator 19)	<ul style="list-style-type: none"> <li>BAU could have been applicable, but baseline is not robust enough to calculate it (only one measurement before implementation leaves no room to understand how this indicator would behave in the future if no measure had been conducted).</li> </ul>
7 - Number of PT users (City specific indicator)	<ul style="list-style-type: none"> <li>BAU will rely on a linear trend line for the 2009-2012 period considering data collected in 2005 and 2008 (prior to Green Line implementation)</li> </ul>
8 - Number of PT related accidents in target area (City specific indicator)	<ul style="list-style-type: none"> <li>BAU considers the same value as in 2008 (because in 2008 the drivers received training in defensive driving), so it would be incorrect to define a trend line with the previous years).</li> </ul>
9 - Traffic level (POINTER core indicator 21)	<ul style="list-style-type: none"> <li>Taking into consideration that between 2006 and 2012 new roads have arisen on the borders of the catchment area, intending to deviate some traffic from the street used by the Green Line (Monumental road) for BaU purposes it was assumed that after implementation of MIMOSA there would be 15% less traffic in the area even if the measure had not been implemented.</li> </ul>
10 - Hotel support (City specific indicator)	<ul style="list-style-type: none"> <li>Since Tourist Kit did not exist before MIMOSA, BAU is not applicable.</li> <li>Nº of courtesy buses is assumed to maintain steady.</li> <li>Km travelled by courtesy buses is assumed to maintain steady.</li> <li>Passengers travelling in courtesy buses will vary on the basis of the % of overnights in Madeira. The reduction of overnights stays will thus reflect on the number of passengers using the courtesy bus.</li> </ul>
11 - Measure acceptance level (POINTER core indicator 14)	<ul style="list-style-type: none"> <li>Not applicable.</li> </ul>
12 - Number of spatial equipment/layout in target area bus stops (City specific indicator)	<ul style="list-style-type: none"> <li>For shelters, seats, information regarding bus lines and information regarding city network, according to the plan of CMF to improve the bus stops in Funchal, in 2011 two more bus stops were equipped. For bus docks in 2011 it will be the same as in 2008.</li> </ul>
13 - Number of wheelchair users (City specific indicator)	<ul style="list-style-type: none"> <li>The value registered in 2008 was considered for 2011 because if it wasn't for CIVITAS-MIMOSA, a policy of assigning only low-entry buses to the target area would not have been implemented. So it is assumed that the values would remain the same as the ones registered in 2008.</li> </ul>

## C2 Measure Results

The results are presented under sub headings corresponding to the areas used for indicators – economy, energy, environment, society and transport.

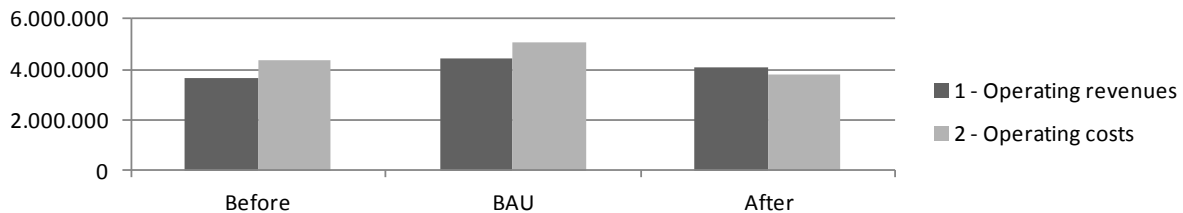
### C2.1 Economy

The implementation of Green Line was needed to cope with a situation in which overlapping service was creating inefficiencies. So this is one of the cornerstones that urged local authorities to take on board measures to reorganize the public transport service in the catchment area.

**Table C2.1.1: Operating revenues and operating costs**

Indicator	Before (2008)	BAU (2011)	After (2011)	Difference: After – Before	Difference: After – BAU	Difference (%): After – Before	Difference (%): After – BAU
1 - Operating revenues (€)	3.678.168	4.413.976	4.043.666	365.499	-370.309	10%	-8%
2 - Operating costs (€)	4.384.928	5.063.958	3.794.367	-590.560	-1.269.591	-13%	-25%

**Chart C2.1.1: Operating revenues and operating costs (€)**



### C2.2 Energy

Not applicable.

### C2.3 Environment

Green Line has been paving the way towards a liveable urban environment. Examples to prove this are the results achieved in NO<sub>x</sub>, CO<sub>2</sub> and PM<sub>10</sub> emissions presented below.

**Table C2.3.1: NO<sub>x</sub>, CO<sub>2</sub> equivalent and PM<sub>10</sub> emissions**

Indicator	Before (2008)	BAU (2011)	After (2011)	Difference: After – Before	Difference: After – BAU	Difference (%): After – Before	Difference (%): After – BAU
3 - NO <sub>x</sub> (t)	14,87	14,84	10,84	-4,03	-4,00	-27%	-27%
4 - CO <sub>2</sub> eq (t)	1.464,00	1.461,64	1.277,00	-187,00	-184,64	-13%	-13%
5 - PM <sub>10</sub> (t)	0,55	0,55	0,29	-0,26	-0,26	-47%	-48%

Figure C2.3.1: CO2 eq emissions

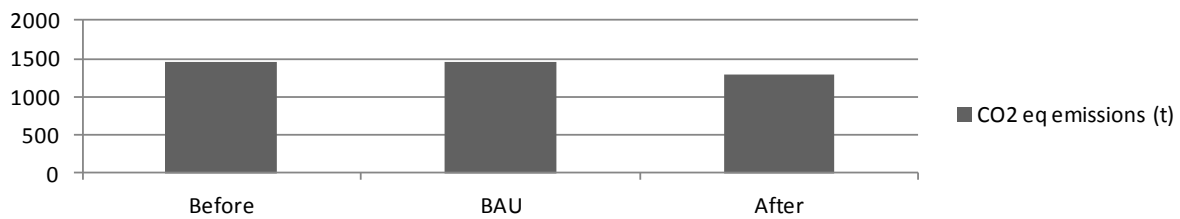
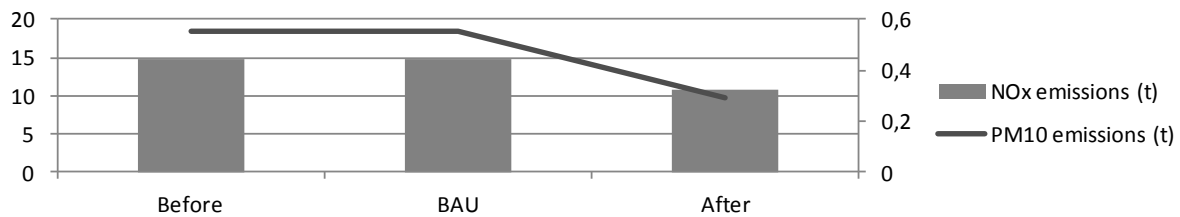


Figure C2.3.2: NOx and PM10 emissions



Climate change emissions and local level emissions have decreased heavily due to the allocation of Euro V buses exclusively to operate in this measure catchment area. So one can reasonable conclude that the sea-side coast where many tourists and locals mingle is making steps to become a low-emission area where pedestrian, cycling and other leisure activities are appropriate and must be encouraged.

The results encountered are likely to contribute to promote a liveable city even more appreciated by locals and tourists alike, therefore meeting the high level goals this measure has fixed in terms of reduction of transport-related emissions and improvement of quality of life.

## C2.4 Transport

### 6 - Quality of service

Continuous measurements of service quality help public transport to achieve the desired performance standards. The methodology of focusing the service quality results on the target area ought to be effective to assess the impact the measure had on its final user, the client. Sample sizes are very irregular but it is important to notice that the lowest sample size collected (in 2007) is embedded in a representative study that supported the drafting of the Urban Mobility Study of the city of Funchal (the sample is thus representative in its structure).

Table C.2.4.1 - Perception of PT service quality for the target area

	2007 (before CIVITAS; N=28)	2010 (phase 2 of Green Line; N=114)	2012 (phase 3 of Green Line; N=187)	$\Delta$ 2012/2007	Difference (%)
6 - Perception of PT service quality	7,0	6,9	8,5	1,5	21

According to EMF2007, the global satisfaction with PT service among people that use it on Green Line impact area was 7,0 on a 1 to 10 scale (this number is based on a very small sample size), whereas the global satisfaction with PT in Funchal in general was 7,19. In 2010, when Green Line was in the 2<sup>nd</sup> implementation phase, the survey revealed that the

global satisfaction of the bus lines related with this measure was 6,9 in a 1 to 10 scale, and a satisfaction of 6,74 for PT in general. One should outline that during this phase the service was subject to a stream of complaints due to the lack of a seamless service from the neighbourhoods on the edge of the city to the city centre. So it comes as no surprise that in 2012, in the final net configuration, the satisfaction scored the highest value ever with a 8,5 mark in a 1 to 10 scale. Another factor that could explain these good results are the installation of multimedia kiosks along the Green Line corridor which provide information about the PT service and the new scheme to better answer the ongoing complaints that the PT Operator has devised to provide prompt answers to unsatisfied customers.

## 7 – Number of PT users

As in many other places around Europe, the number of public transport users in Funchal has been decreasing continuously. Between 2008 and 2011, the figure concerning the overall network system has decreased by 10% so it is necessary to check to which extent Green Line was able to tackle this negative trend.

**Table C2.4.2: number of PT users**

Indicator	Before (2008)	BAU (2011)	After (2011)	Difference: After – Before	Difference: After – BAU	Difference (%): After – Before	Difference (%): After – BAU
7 – Number of PT users (tickets sold)	4.086.853	4.087.095	4.096.422	9.569	9.326	0,234%	0,228%

The objective of making an attractive public transport service was completely accomplished. After MIMOSA, the number of PT users increased by 0,2% against the Before and BAU scenarios. These results have to be interpreted as a very optimistic and successful effect of the measure and mirror the efficiency of the service, as the overall number of kilometres and PT passengers in general (for the urban service) are decreasing. So this result can to some extent be considered a direct effect of all the work carried out to make Green Line more appealing with the network reorganization, promotion of new communication campaigns, establishment of a wide range of communication tools, creation of commercial approaches to hotels and design of a fresh image for the buses.

## 8 – Number of PT related accidents

The main objective of the measure, to redefine the network so as to make it more efficient and appealing to locals and tourists alike, was encompassed by actions from the Municipality to make public transport more accessible and especially safer. This was done, for example, by implementing a 900 m stretch of bus lane and by implementing a traffic management plan.

Table C2.4.3: number of PT related accidents

Indicator	Before (2008)	BAU (2011)	After (2011)	Difference : After – Before	Difference: After – BAU	Difference (%): After – Before	Difference (%): After – BAU
8 – Number of PT related accidents	43	43	30	-13,00	-13,00	-30%	-30%

By doing the above, fewer accidents occurred and therefore significant steps have been taken to achieve the measure specific objective of having a safer road corridor in an area where many people go to either for work or for leisure. In fact, the total number of PT related accidents has fallen by 30%. This is a good sign and must be considered in large part as a direct effect of this measure (the Municipality created a new bus lane that partially covers the Green Line corridor) but also of an overall decrease in the number of vehicles circulating in Funchal due to the financial crisis. OCCAM, a consultancy company hired by the Municipality to undertake an environmental and energy campaign, registered a decrease of about 13% in the total number of vehicles circulating in the area.

To understand to which extent this large achievement is a result of this single measure, one has compared in table C2.4.4 the number of accidents/100.000 km in the Green Line corridor and on the overall PT network.

Table C2.4.4: Comparison of PT related accidents in the Green Line against the overall network

Area	Indicator	2008	2011	Difference: After –Before %
Green line target area	Nº of PT related accidents	43	30	-30%
	Accidents/100.000 Km	3,7	2,4	-36%
Overall urban PT network	Nº of PT related accidents	659	596	-10%
	Accidents/100.000 Km	8,8	9,1	3%

The results clearly show that while accidents had increased on the overall urban PT network, in the catchment area of Green Line accidents rates have shifted the other way around.

Nonetheless, this indicator is also an indirect effect of eco-driving training that occurred since 2008 targeting PT drivers that drive most of the Green Line buses, with a strong component on the prevention of road accidents so these results should be taken cautiously.

## 8 – Traffic level

The Western city area where Green Line was deployed attracts almost 50% of Funchal's workforce. The area has today one of the highest congestion rates in Funchal, which silently pollutes and undermines the image of Funchal as a high quality destination (a survey of the Regional Tourism Directorate DRT 2004 stresses that traffic jams and too many parked cars were considered by tourists as the main negative aspect of Madeira). This context gives this measure a high political priority.

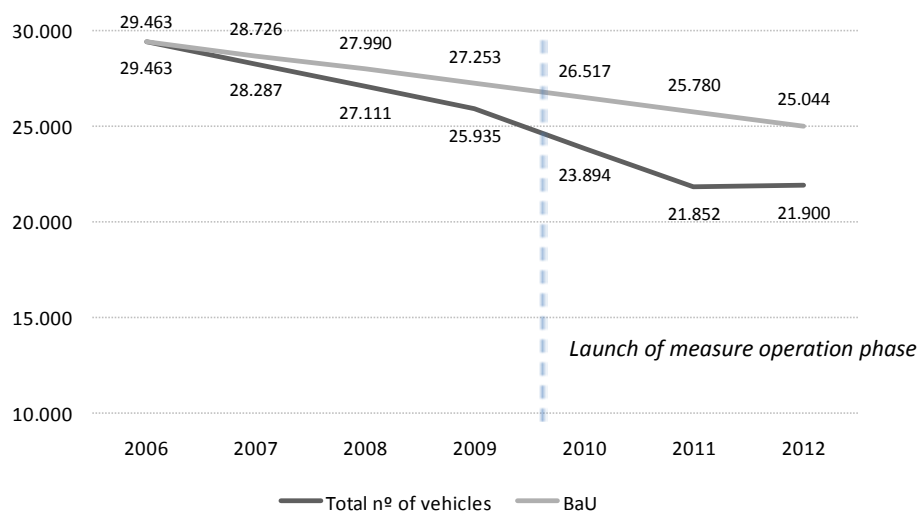


To increase public transport competitiveness, and consequently smooth the average commercial speed of the more sustainable modes of transport, it is important to better manage traffic flows. To do so, vehicle counting took place during peak-hours.

**Table C2.4.5: Traffic level assessment**

Indicator	Before (2006)	BaU (2012)	After (2012)	Difference : After – Before	Difference: After – BaU	Difference (%): After – Before	Difference (%): After – BaU
9 – Traffic level (total number of cars)	29.463	25.044	21.900	-7.563	-3.144	-26%	-13%

**Figure C2.4.1: Traffic level assessment**



The BaU scenario depicts and conveys all major traffic trends in Green Line catchment area helping to understand the evolution within the project lifetime. The total vehicle traffic greatly decreased on the roads crossed by Green Line, from 29.463 vehicles in peak hours to 21.900, a total of 7.563 fewer vehicles.

To better understand this preliminary result, one has to reflect on the dynamic of the target area, a place where many new buildings arose so the decrease of traffic can be attributed to the shift in heavy traffic caused by working activities. On the other side, the number of vehicles circulating and the motorization rate in Funchal has been decreasing since 2008, and several new roads have arisen in the area during the project lifespan giving drivers a range of new alternative routes.

All in all, one can conclude that the decreased traffic levels are a success because it greatly helps the achievement of reduction in private car use and global environmental quality in the area. However this result is not derived from the Green Line itself. Instead it would have been arguably influenced mainly by the economic crisis Portugal is facing which limits the availability of private car use for travelling.

On the other side, it is important to bear in mind that the counting spots covered only a limited area within this measure's catchment zone, so this result has to be considered as approximate.

## C2.5 Society

### 10 - Hotel support

Many of Funchal roads are much more than mere transport corridors. Those which are located in the Green Line impact area wind their way through beautiful cliffs, offer fantastic views and provide access to historic landmarks. This makes the new Green Line service highly appreciated by tourists. One of the strategic goals of the Green Line measure is to persuade hotel managers to be in the front line of a greener solution, by promoting public transport rather than providing their own courtesy buses.

Hotel managers who have accepted this initiative are given a tailored-made package, titled as tourist kit, which includes a valid ticket personalized by the hotel they're staying in. The tickets available are either for one, three or five days. Plus, the pocket Kit provides some information about the most exciting and interesting spots to visit throughout the city, whereby this is by far the most efficient way to plant new sustainable mobility habits. An example of public transport network map/brochure that is included in tourist kit is available in the annex I.

Figure C2.5.1: Tourist Kit poster



Table C2.5.1: Hotel support for Tourist Kit, comparison between scenarios 2012 (phase 3 of Green Line)

	Before (2009)	After (2012)	
		Total Hotels	Hotels with Tourist Kit
Courtesy buses	12	6	-
Hotels with courtesy bus service	21	15	8
Hotels without courtesy bus service	21	27	11
Total number of hotels	42	42	19
<b>9 – % of support for Tourist Kit</b>			<b>45%</b>

Table C2.5.2: Hotel support for Tourist Kit, comparison between scenarios

Indicator	Before (2008)	BAU (2012)	After <sup>3</sup> (2012)	Δ: After – Before	Δ: After – BAU	Δ: After – Before (%)	Δ: After – BAU (%)
No. of hotels supporting Tourist Kit	N/A	-	19	-	-	-	
Total no. of courtesy buses in the catchment area	12	12	6	-6	-6	-50%	-50%
Nº of km travelled by courtesy buses	193.928	193.928	134.443	-59.485	-59.485	-31%	-31%
Nº of passengers travelling in courtesy buses (year)	993	859	739	-254	-120	-26%	-14%

By July 2012, HF has signed a protocol with 19 hotels in the framework of the Tourist Kit strategy, one of which lies beyond the catchment area (because it was in the same chain of other located in this measure impact area and wanted to join as well).

<sup>3</sup> After data relates with information collected in 2012 and estimated for the whole year.

In 2009, some months before this measure was launched, there were 42 hotel units in the target area, 21 of which have courtesy buses. The Municipality held a meeting in September 2009 for hotel managers to take part in a new strategy for this highly important area, engaging them in the tourist kit initiative described earlier. Representatives of 24 hotels attended the meeting.

Funchal's proposal is to reach 20% support out of the overall 42 hotel units. Horários do Funchal as measure leader has surpassed this goal achieving a **total of 45% support** in less than 3 years. The reasons for this success was that Horários do Funchal was able to show to the tourism industry that promoting public transport among tourists is worth and can be considered a win-win approach, with financial advantages for all the parties involved: tourists who have better information and easy access to the city centre and main landmarks; hotel staff who earn some financial incentives by selling PT tickets; and the PT itself who sees a market niche it wishes to capture more of.

The result of the cooperative work carried out together with the hotels is the number of tourist kits sold: 3.408 in 2010 and 5.022 in 2011, as one can read with more detail in the cost-benefit annex further below.

### **11 - Measure acceptance level**

To measure and understand to which extent citizens of Funchal were eager for rearrangements in PT service in the West part of the city of Funchal, two surveys were conducted in Expo Madeira, the most important exhibition of commercial activities in the entire Region. The CIVITAS local team took the chance to conduct a survey with a total of 792 individuals in 2010, and 810 in 2011<sup>4</sup>.

In 2010, 224 citizens out of the total of 792 individuals lived and/or worked in Funchal and used the public transport; whereas 170 citizens fulfil this profile in the survey conducted in 2011. This is the sample size of the results showcased below.

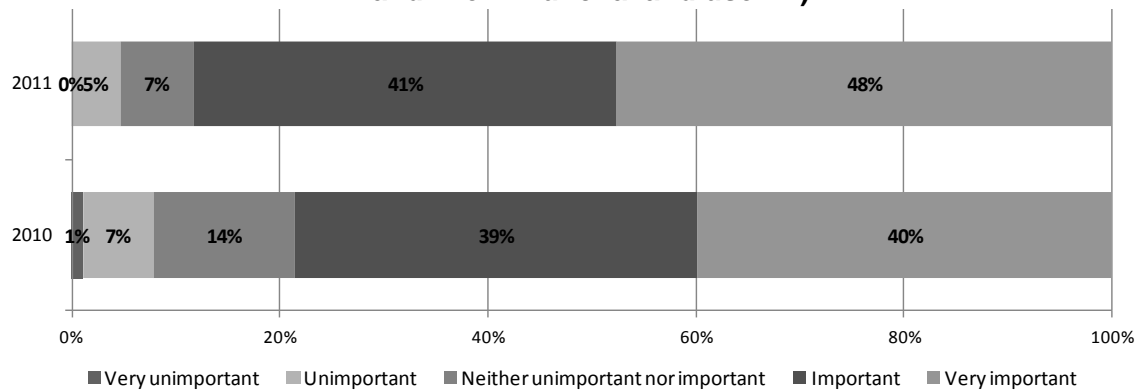
It seems that the importance of Green Line is a bit stronger in 2011 than in 2010 (but data has to be taken cautiously because no statistical evidence was found). This can be attributed to the about-turn of the managing team during the 3<sup>rd</sup> phase (which began in January 2011) to cope with the disappointment of people who had to take two buses to get home/to work. Nevertheless, it's worth mentioning that 'important' and 'very important' scores are very satisfactory in both years (subject to analysis).

It is important to bear in mind that the surveys were conducted in the month of July, the summer season, and that the Green Line has introduced a new connection to some public beaches. This characteristic partially explains the good results encountered. People seem to be happy that the Green Line can provide a seamless and convenient transport that suits their mobility needs.

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<sup>4</sup> Participants were asked the following question: «Point out to which degree Green Line is useful for you?» Answers can range from «Not useful at all» to «Very Useful». People might also not have an opinion on this matter: «Without opinion» blanket.

**Figure C2.5.2: Feeling of usefulness with regard to Green Line (among those who work and live in Funchal and use PT)**



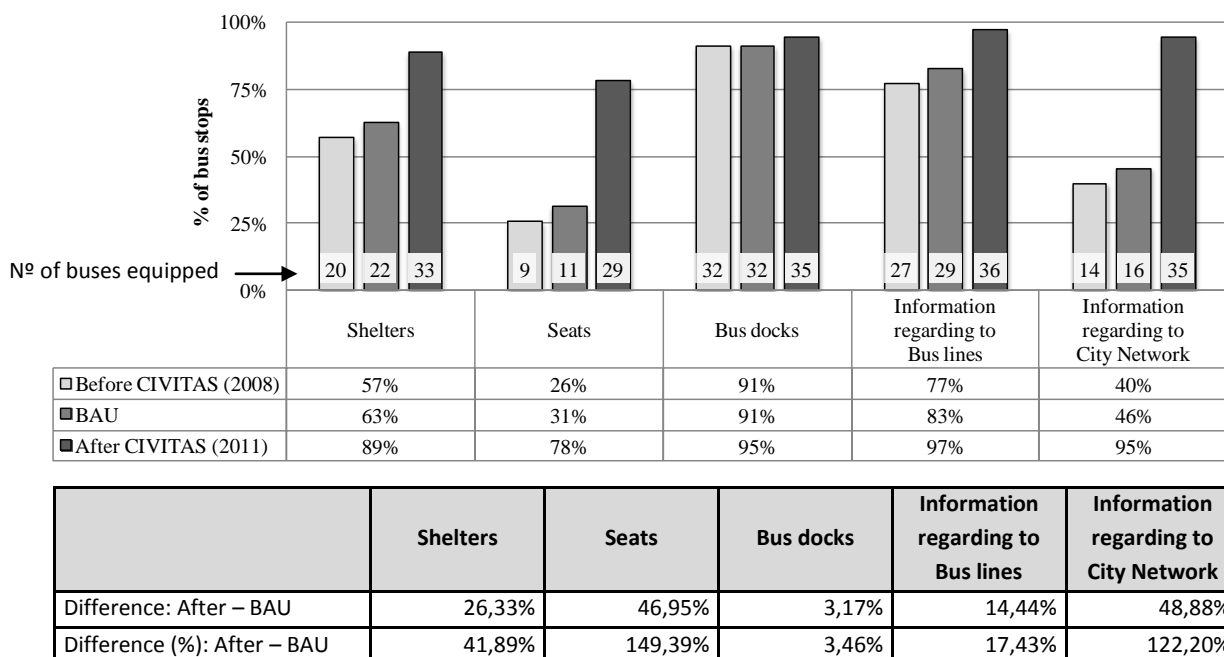
**Table C2.5.3: Feeling of usefulness with regard to Green Line (among those who work and live in Funchal and use PT)**

	2010 (n= 224)	2011 (n= 170)
Very unimportant	1%	0%
Unimportant	7%	5%
Neither unimportant nor important	14%	7%
Important	39%	41%
Very important	40%	48%
<b>10 - Important and very important ratio</b>	<b>79%</b>	<b>88%</b>

**12 - Spatial equipment/layout in target area bus stops**

One of the most interesting outputs of the Green Line was to raise the bus stop level along the cycle lane path. This indicator was not calculated, though the new infrastructures optimizes the ease of use of the new service especially among mobility-impaired citizens, but also for pedestrians and cyclists.

**Figure C2.5.3: Spatial equipment/layout in target area bus stops**



A PT Operator local team has extensively registered the on site conditions of all bus stops that serve Green Line. This work has led to improved conditions at 19 bus stops overall and to create brand new bus stops (three, in each direction), which were located in a new path near the promenade (where only pedestrians and cyclists are allowed to circulate) where public transport did not run before CIVITAS.

Before the first step of Green Line, the bus that went from the city centre directly to Ilma (where the new terminus was build), had to serve 17 bus stops in both directions, whereas, in its first and second phase it has to serve 19 bus stops. In the opposite direction, buses have to serve 18 stops.

Arguably, one can assume that the new and improved facilities in the bus stops in terms of information provision, safety and comfort have played a role in the overall satisfaction rate with public transport.

### 13 – Number of mobility-impaired users

Mobility-impaired users benefit a lot from this measure, which gives them more mobility options. Now they can board any bus in the area, whereas before they didn't know in advance if the bus would be low-entry and therefore couldn't rely on regular public transport service.

**Table C2.5.4: N° of wheelchairs boarding buses in target area, comparison between scenarios**

Indicator	Before (2008)	B-a-U (2011)	After (2011)	Difference: After – Before	Difference: After – BAU	Difference (%): After – Before	Difference (%): After – BAU
13 - Number of wheelchair users	24	24	351	327	327	1363%	1363%

The baseline has revealed that, in 2008, wheelchair users were transported 24 times in the target area. This number has been increasing sharply as the measure stepped into the operation phase and started assigning regular PT services with low-floor buses exclusively. This is the main conclusion of Chart C2.5.7 which shows the total number of wheelchairs in all the routes affected by the implementation of this measure. It is important to underline that this impact may have indirect benefits for the company as it reduces the need for a special service dedicated to people with reduced mobility which is by far more expensive.

In this case, we did not made significance tests since it is obvious that Green Line network changes have impacted the number of wheelchair users positively. Green Line had increased the confidence of a wheelchair user to head to the bus stop and wait for the bus to arrive.

## C2.6 Cost-Benefit Analysis

Evaluation activities also kept an eye on the calculation of cost-benefit aspects of this measure using a methodology applied to the Tourist Kit feature which clearly assumes Green Line as an effective substitute mode of transport for the courtesy buses. Detailed and technical information about cost-benefit analysis can be consulted in cost-benefit annex.

**Table C2.6.1 Net present value**

Beneficiary	Total After-BAU	NPV 2008
HF	Costs	972.138 €
	Revenues	6.481.825 €
	Revenues - Costs	5.509.687 €
Hotels	Costs	-1.139.594 €
	Revenues	254.932 €
	Revenues - Costs	1.394.525 €
Society	Emissions costs	-756,913 €
<b>Total</b>		<b>7,661,126 €</b>

This exercise was instrumental to realize that the benefits can be surprisingly high with an eye on the horizon 2015 if a scenario where all the courtesy buses stop providing service to the city centre and tourists are diverged to public transport routes is established. If so, one should expect:

- As can be seen in the dedicated annex, the results of the cost-benefit analysis indicate that the general benefits (difference between revenues and costs) would be of 7.661.126€ (considering the difference between after and Business as Usual which means
- Hotel industry can benefit a total of 254.932€ (2010 – 2015) in commissions by selling public transport tickets while hotel owners can save 1.139.594€ in operational costs of their hotels. This is definitely an important incentive for them.
- When slightly increasing the frequency of the Green Line to accommodate former courtesy-bus clients, evidence shows that fewer tons of greenhouse effect equivalent (CO<sub>2</sub>) are emitted (-339 tons/year).
- Tourist Kit and the promotion of public transport in hotels have the potential to lead to a decrease of 228.220 inefficient km/year by courtesy buses. This equals roughly 90.000 Litres of fuel saved.
- For sensitivity analysis purposes, two types of experimental scenarios were further developed and tested. The first set of scenarios aimed at investigating the possibility that the fuel cost would not rise sufficiently to convince hotel owners to drop their courtesy service; while on the other scenario the PT Operator would raise the commissions to hotel staff which in turn would increase the involvement in selling Tourist Kit. In all of these scenarios, the NPV becomes fairly positive<sup>5</sup>, but for now it is important to summarize the evaluation results for the reference scenario (the most likely one):

<sup>5</sup> The details of these two sets of scenarios are explained in more detail in dedicated annex.



### C3 Achievement of Quantifiable Targets and Objectives

No.	Target	Rating
1	▪ At least 5% increase of PT passenger in the target area;	O
2	▪ At least 2 % reduction of CO <sub>2</sub> , NO <sub>x</sub> and PM emission in target area;	***
3	▪ Reduce accidents involving public transport by at least 2%;	(**)
4	▪ Hotel support of the service (at least 20% of total Hotels in the area);	***
5	▪ Improvement of satisfaction of tourists and citizens by at least 5% (before and after the service implementation);	(***) NA (tourists)
6	▪ Improve traffic circulation in the hotel area and in the city centre (reduction of traffic flow in the area by 5% as far as motorized vehicles is concerned);	(**)
7	▪ Increase by at least 5% the speed of PT, in the target area;	NA
8	▪ Increase social inclusion of older people and wheelchair users.	(**) NA – (older people)
<p><b>NA = Not Assessed    O = Not Achieved    * = Substantially achieved (at least 50%)</b>  <b>** = Achieved in full            *** = Exceeded</b></p>		

Despite the fact that Green Line has not achieved a 5% increase in the PT passengers in the area (probably due to a decrease in the number of km performed), the service was able to yield important contributions to a general decrease of greenhouse gases and gases harmful to those who walk in the area.

There are reasons to believe that the decreased number of accidents can be a result of the number of vehicles which has been fallen by 13%, or due to the skills of drivers which have been improving due to specific training tailored to them, part of which falls under the umbrella of the CIVITAS measure Eco Drive (FUN 6.1.). Nevertheless, the results show 30% fewer accidents which means that this measure was at least partially responsible for avoiding some accidents.

In 2012, the satisfaction rate of local commuters is about 21% higher than in 2007. Yet, the satisfaction of tourists was not directly assessed. Nonetheless, the support for Tourist Kit and consequently the high number of PT tickets sold (over 5.000 in 2011) allows the assumption that this measure has favourably influenced their satisfaction rates with the local public transport system.

The traffic circulation in the area has decreased far more than the forecasted 5%, although these figures should be taken with caution because the external factors that motivate people to not use any motorized mode of transport could have been overlooked in the BaU scenario due to the rising price of fuel and the general crisis that struck Portugal in 2011<sup>6</sup>.

Moreover, the PT speed was removed from the indicator list due to the reasons explained in Table C1.2.

As for the social inclusion objectives, the impact of this measure on older people was not assessed; but the impact of the measure on wheelchair users was substantial and the effect was fairly positive.

Green Line is, thus, an agenda-setting measure, which is being commonly understood by both the PT Operator and the Municipality as a steering wheel to enhance sustainable mobility in Funchal.

<sup>6</sup> Namely, the Portuguese financial bailout.

## C4 Up-Scaling of Results

Green Line impact area lies on a more or less confined flatland stretching along the coast and the historical centre. Hence, up-scaling activities towards the implementation of similar measures in other parts of the city, which are steeply uphill, will be very difficult. So what is truly up-scaled are the auxiliary actions related with Tourist Kit which was planned to be associated with the Green Line, but whose potential can spread towards all the public transport catchment area so as to include more hotels. For PT practitioners, the gist behind any up-scaling activity is to put themselves in the tourist's shoes and provide the tourists with the chance to get to all the attractions and interesting spots by public transport. In addition to this, further activities are planned to sustain Tourist Kit over time and give public transport a decisive boost (for further details, please read section C7).

## C5 Appraisal of Evaluation Approach

The deviations from the original plan have threatened a successful implementation of the evaluation activities. The local team responsible for the evaluation has sought to prepare a full-scale assessment. But some emerging problems have changed the impact of this measure (down-sized the impacts). That was the case during tender process when hybrid/electric buses could not be purchased. The hybrid buses could have led this measure to achieve even more meaningful results in terms of service quality (regarding to satisfaction with buses emissions) and emissions savings.

Other important deviation relies on the negative feedback from the resident population. When this feedback arose, the implementation shifted and a 3<sup>rd</sup> phase began which threatened the evaluation time plan and some of the initial indicators chosen (e.g. PT speed).

Other indicators were chosen at the beginning of the project but had to be dropped or could not be assessed because of poor association with this single measure. Example of this are noise exposure whose calculation must be indirect and will definitely not be meaningful enough.

Due to delays in the tender process for the environment and energy consultancy process, the first campaign was only carried out when the Green Line was already in its 2<sup>nd</sup> phase. So no baseline was collected and therefore could not be presented in this document which is a downside in the evaluation framework of the Green Line.

As opposed to air pollutants, there is no monitoring system for noise in Funchal. But air pollutants have also suffered from financial constraints which impeded the use of a mobile station which was supposed to be used for the evaluation of the major roads where Green Line spreads along.

It is noteworthy that some impacts of this measure will only appear in the next few years, such as the Tourist Kit which is helping to make public transport perception more positive among the tourist industry.

## C6 Summary of Evaluation Results

The key results are as follows:

- **Financial balance was achieved** – the operating revenues of the public transport service in the Green Line target area have increased by 10% against the scenario before MIMOSA, whereas the operating costs have been reduced by 13%;

- **Reduction of pollutant levels in a range of 13% (CO<sub>2</sub>eq) to 43% (PM<sub>10</sub>)** – due to the allocation of Euro V buses to this area;
- **High acceptance and satisfaction levels** – this measure is perceived as essential for the development of local economy (based on tourism) and the satisfaction rates among the PT users in the target area have risen due to the quality of the buses, information provision and of the improved bus stops;
- **Bus stops improvements** – the bus stops in the area were substantially improved with shelters, seating availability, bus docks, information about either the bus lines and the city network and real-time information of the buses;
- **High hotel support for Tourist Kit** – in less than 3 years, 45% of all the hotel units located along the target area have supported Tourist Kit and have started selling PT tickets at the reception desk;
- **Increase social inclusion** – substantial achievements have been made in the inclusion of people with mobility limitations, namely wheelchair users which increased sharply due to the implementation of the Green Line;
- **Presence of less vehicle intensive streets** – the road network in the Green Line catchment area benefited from a reduction of 13% in the overall traffic levels due to a number of factors: *i)* the overall economical crisis which led people to reduce the number of private trips made; *ii)* new roads that were constructed during MIMOSA and allow residents to choose other streets; *iii)* and lastly, but not least important, due to the encouragement and bold actions taken within CIVITAS to curb unwanted traffic in this area so as to make it ideal for softer modes of transport.

## C7 Future Activities Relating to the Measure

Green Line was instrumental to fine-tune an optimal PT service in a touristic area, tackling problems of overlapping service. But it was mainly important to promote public transport among tourists, giving to regional authorities some food for thought.

Now that hotel managers are realizing that public transport, and Tourist Kit in particular, can be an added-value for their hotels (in terms of promotion, capitalization of the hotel accessibility and tourist satisfaction), the PT Operator, together with the Municipality and the Regional Government, will seek to enhance Tourist Kit, by promoting it as the best option for tourists to travel to the city centre whenever an event takes place (e.g. a firework display). Improvements in the Tourist Kit will also rely on a broader package integrating partnerships with museums. In that case the PT Operator would provide discounts for a selection of museums to those who purchase Tourist Kit.

Thanks to the lessons learnt during this project and the new ideas that arose, PT operator is now developing another project SEEMORE (2012-2015). The target group are the tourists, and some of the new activities comprise: improvements of information access/promotion of PT use towards tourists before their arrival; better integration regarding communication; and ticketing between urban and interurban public transport.

In addition, provision of PT related information in German will be made available in the future following some suggestions made by PT clients during this measure implementation lifetime.

## D Process Evaluation Findings

### D0 Focused Measure

Reason		
The measure fits into the EU policy towards clean urban transport (five pillars of the EU Green Paper)	1	Most important reason
The measure fits into the city policy towards sustainable urban transport and / or towards sustainability in general	2	Second most important reason
The measure is regarded as an example measure	3	Third most important reason

### D1 Deviations from the Original Plan

The deviations from the original plan comprised:

- **Deviation 1: Network streamline in three phases rather than in two** – The route of the Green Line has been changed three times during operation phase and not twice as previously planned due to several complaints from citizens that had to shift from one bus to another to reach households located on the edge of the city. So the concept of creating a high frequency line in a smaller corridor, served by peripheral routes that would feed the main one failed.
- **Deviation 2: Hybrid/electric buses not purchased** – The introduction of three electric/hybrid vehicles in the target area (two of them co-financed by ERDF) was not feasible, since the tender process to purchase them failed to fulfil all the technical requirements. Considering that the buses that operate in the target area are all Euro V, the results in terms of emissions will be of minor relevance. The main effect of this change was the lack of local testing/demonstration of hybrid/electric buses which turned out to be not suitable for our topography.
- **Deviation 3: Tourist Kit in the spotlight** – This package has started as an auxiliary action to support the Green Line and promote public transport in hotels. But it turned out to be one of the most important and more interesting features of this measure, creating breakthroughs in terms of nurturing green and responsible mobility habits.

### D2 Barriers and Drivers

The Green Line measure working plan was well balanced and shifted from a preparation phase to an implementation and operational phase in one year, giving plenty of room for fine-tuning and evaluation. Hence, most of the barriers and drivers have had an influence on the entire measure process.

#### D2.1 Barriers

##### Overall barriers

- **Strategic planning for the city (1– Political/Strategic)** – Green Line has all the features to become one of the most far-reaching urban policies of Funchal. Therefore, it would be important for policy-makers to bundle the Green Line to the ongoing structural projects (construction works) to revitalize the West side of the city. Otherwise, the measure will lose its flagship status and public transport will continue to be considered not relevant for urban planners. During this measure lifetime, the Municipality has prepared and launched a public procurement (in 2011 and another in

2012) to expand the cycle lane and restructure all the tourist area of Funchal. This work has been carried out with disregard to the Green Line rationale. The Municipality failed to see that this service could have been a focus point of the overall restructuring activities in the tourist area of Funchal (for example, by giving PT priority at intersections to raise commercial speed of buses). This barrier impacts mainly on the long-term and on the basis of urban planning policies.

### **Implementation phase**

- **Internal organizational structure (8– Organizational)** – As the PT Operator operations policy is that buses can be assigned to any route, Green Line buses ran on lines other than the specified corridors. This created some misunderstandings among the PT users, as the buses were decorated with the Green Line brand.

### **Operation phase**

- **Limitations to the expansion of Tourist Kit (6– Positional)** – Most hotels do not sell public transport as often as the PT Company would like since there is a strong business relationship with taxis that give big commissions to hotel receptionists in order to persuade tourists to choose them over the public transport service. In addition to this, one should take into consideration that some hotels cannot abandon their courtesy bus as they have commercial agreements with tourism operators that urge them to pick up tourists at the airport and maintain a regular shuttle service from hotels to the city centre.

## **D2.2 Drivers**

### **Overall Drivers**

- **New image of PT (5– Involvement, communication)** – As the environmental theme has been increasing in importance and gaining an agenda-setting status in all the media and public speeches, public transport in Funchal is now associated with green initiatives and this is partly owing to the Green Line. Green Line mirrors what PT in Funchal is all about. With a fresh and punchy brand on the bus stops, multimedia kiosks and bus decoration, it gives a clean and attractive image of Local Public Transport and of CIVITAS as well.

### **Implementation phase**

- **Enforcement actions deriving from the implementation (4– Problem related)** – The enforcement program of Green Line measure entailed the introduction of a new tariff (time orientated), Tourist Kit promotion at hotels, and accessibility and comfort improvements at bus stops. As for the internal processes that HF has developed, it is important to notice that the PT Operator created new schemes to better answer all the ongoing complaints. Moreover, Green Line measure unfolded a new relationship between PT Operator and hotel managers, which aim for a common goal: to improve the mobility habits of the tourists. Also a new award arose with the support and sponsorship of the Regional Government. It is important to outline that this new mobility-wise award recognized and hailed in 2010 the Tourist Kit as the most important urban mobility policy.



## D2.3 Activities

### Preparation phase

- **Design a new brand for the Green Line package of actions** (5– *Involvement, communication*) – Horários do Funchal has developed a new brand for the Green Line route to make it more distinguishable as quality and fresh service. All what was developed within this measure has also stick to this brand, namely the multimedia kiosks, the bus stops and all the communication material, including the one related with Tourist Kit.

Figure D2.3.1: Green Line bus



### Implementation phase

- **Photo session to design new communication campaigns** (4– *Problem related*) – Horários do Funchal issued a subcontract to take professional photos of the PT service. The theme that oriented this photo shoot was the passenger and its PT Operator, and included, for example, photos of young citizens laughing inside a bus, elderly taking the bus, business people listening to music or reading a book inside a bus. Even though this activity was not claimed in this measure budget, it's important to notice that the purpose of it was to tackle the stigmatization of PT service referred to above, when referring to the barriers.
- **Ongoing monitoring of PT users** (7– *Planning*) – The stepwise working plan of the Green Line relies on ongoing monitoring. The third phase of Green Line was the result of retuning the public transport supply to people's real needs. This certainly played a role in increasing the number of PT users in this measure catchment area.
- **Involvement of the Regional Government through the Local Ambassador Award** (5– *Involvement, communication*) – To overtake communication barriers and develop new solutions to gather more hotels to the tourist kit, the local team created the new local ambassador award, designing a tailored prize that can now be transferred to other cities within the CIVITAS network. This award was also helpful to welcome the commitment of the Regional Government for tourism and transport affairs who was a bit reluctant regarding CIVITAS at first. Growing this relationship is paramount to cultivate a long term endorsement and to involve the Regional Government in other MIMOSA measures.



Figure D2.3.2: Ceremony of delivering the Local Ambassador Award



## D3 Participation

### D3.1 Measure Partners

- **Horários do Funchal**, as local bus operator, is responsible for the measure and triggered and controlled the actions related to Green Line.
- **Municipality of Funchal**, as a MIMOSA partner, supported the deployment of the Green Line by implementing important actions to improve the bus stops along the target area.

### D3.2 Stakeholders

- **Regional Government for transport affairs**, even though sceptical towards the project in the beginning, started committing themselves to the project when it unrolled. They envisaged Green Line in particular as a marketing tool to target actual and future tourists. .
- **Hotel managers and receptionists**, they are at the cornerstone of the Tourist Kit strategy and helped deliver the message that public transport is the right choice for urban mobility and an enhancing tool for leisure activities.

## D4 Recommendations

### D4.1 Recommendations: Measure Replication

- **Green Line** – This measure is easily transferable whenever a city wishes to assign the best and more modern buses to foster a quality PT corridor to inspire and encourage people to use the bus. The highly positive Net Present Values assessed by a CBA shows how profitable this measure and its complementary actions can become.
- **Tourist Kit** – Most cities in Europe will most likely not share the same pre-conditions that one can find in the West side of Funchal, nor the event that hotels provide courtesy-buses for tourists to make seamless connections to the city centre regardless of the good public transport supply in the area. But it can occur that whenever a city has plenty of hotels concentrated in a limited area and has good connections to a hub (if not in the city centre, it could also work either with a train station or an airport on the outskirts) and wishes to tackle unnecessary private vehicles between this hotel area and the hub (taxis, mostly). In this situation, tourist kit would fit perfectly, because it provides a cost-effective solution to shift the share towards less pollutant modes of transport.

### D4.2 Recommendations: Process (Related to Barrier-, Driver- and Action Fields)

- **Liaison between measures** – The communication activities have benefited from the small scale range of the package of measures that the city of Funchal has developed within MIMOSA. For example, the local MIMOSA team has concluded that some of the R&D work carried out to support the Green Line was found useful to promote other CIVITAS measures. This has contributed to understand that the environment and

quality of life as well are not key messages to promote. This knowledge was instrumental to prepare the communication campaigns for other measures with similarities in their measure objectives. The communication should rather concentrate on the convenience of the service for PT users and potential users,. So the time gap necessary to arrive in the city centre for PT in comparison with the private mode of transport could be communicated actively, for example. Plus, it was discussed that the communication to the residents should be more personalized, on a door to door basis, as it was made in the first phase of Green Line measure in September. This knowledge was therefore essential to improve the decision-making process of other measures that started after this one.

- **Development of bold(er) actions to enforce soft(er) measures** – By developing tools to promote a modal shift towards public transport for journeys ending in a crowded and/or protected city centre, it would be advisable to develop more strict regulation to prevent unwanted traffic (like the one represented by courtesy buses) from entering the city centre.
- **Exploit synergy effects between projects** – Projects are reinforced when they have a strong financial support. We concluded that mobility projects which have an important financial background to cope with any risk that may show up, are more likely to produce positive effects on the urban area. In the case of Green Line, the financial support of ERDF was an added value for auxiliary measures and to follow up activities like the ones related with Tourist Kit.
- **Communication support materials** – Cities interested in promoting green transport schemes should produce communication and dissemination supports with recycled materials. To disseminate non-recycled materials could lead to a mixed message about the environmental friendly goal CIVITAS has.

# F Annex

## Annex I: Example of public transport network map/brochure that is included in tourist kit



## Annex II: Network map of public transport service in Green Line area before the implementation



### Annex III: Network map of public transport service in Green Line area in the first version



### Annex IV: Network map of public transport service in Green Line area in the second version



### Annex V: Network map of public transport service in Green Line area in the third and final version





## **Cost-Benefit Analysis for the Funchal Measure**

### **1 Introduction**

The Green Line measure includes a number of ambitious objectives to increase the modal split of sustainable modes by means of shifting a share of users from inefficient modes towards public transport. The target area is the suburb of São Martinho, a tourist area where many hotels are concentrated. Transportation from the hotels to the centre is provided by private buses, which contribute to a high level of congestion, especially in the city centre. Today the area suffers the highest congestion levels in Funchal, rendering the new Green Line a priority measure. One of the most appealing ways of achieving this goal is the so-called ‘Tourist Kit’, a tool to persuade tourists to use public transport sometimes, as a substitute to the courtesy buses which provide them with less mobility options as they only connect the hotels to the city centre.

Public transport service quality is a key element in obtaining high levels of satisfaction among both tourists and residents. In areas with high levels of traffic, this task offers an even bigger challenge. This is why it is important to improve public transport services on a key corridor with high levels of traffic as to determine the potential sustainability assets for both tourists and residents. Highlighting the potential of the ‘Tourist Kit’ could be of interest to hotel owners also. For them there is a business opportunity in attracting more tourists and at the same time increasing the income of their staff due to the commissions attached to selling public transport tickets. For tourists this can also be important, as they are disappointed by traffic jams and require seamless connections to the city’s main attractions. Furthermore there is also a benefit for locals, as the regional economy is based on tourism. So any improvement that can trigger tourist satisfaction is warmly welcomed.

#### **1.1. Tourist Kit and courtesy bus strategy in a nutshell**

The public transport operator designed an ambitious scheme to raise the number of tickets sold to tourists and, consequently, to prevent courtesy buses from entering the city centre. This commercial approach is called the Tourist Kit, and includes a folder with brochures illustrating the most

interesting spots and attractions tourists are normally eager to visit. This folder is available from the receptionists in hotel lobbies who can either sell it or give it away for free, depending on the agreement signed between the public transport operator and the hotel management.

During MIMOSA's lifetime, the project was able to count the number of hotels which would sell tickets. The public transport operator is however, pushing hotel directors, especially those who have courtesy buses, to realise what profit they can gain from selling public transport tickets (valid either for 1 day, 3 days or 5 days). These profits can outweigh the costs of deploying courtesy buses. This cost-benefit exercise will therefore be a good tool to help local stakeholders realise the potential of this measure.

To put this scheme into operation, the public transport operator of Funchal gave full support to tourist managers and hotel receptionists. Receptionists are the first point of contact for tourists visiting the city. So in order to embrace them the public transport operator gave an appealing commission on the selling dynamics while hotel managers receive tailored solutions matching hotels' commercial needs.

Most of the hotels have agreements with big tourism agencies in which a courtesy bus to the city centre is a requirement. This is an important barrier to the full acceptance of this measure among hotels in the catchment area. However, if such an obligation is no longer possible due to specific legislation that authorities can produce, the agreements will have to be cancelled and tourists will have to find another way to reach the inner city where most attractions are located. Here an attractive public transport service comes into providing a solution for the tourists' mobility needs.

## **2 Analysis**

Since this is a focused measure, particular attention is devoted to a long-range assessment of the likely results that can be achieved. The further objective is issuing recommendations for cities wishing to take similar actions and to properly weigh the opportunity to transfer this measure elsewhere. For that purpose, the cost-benefit analysis has focused on a sub-set of the main quantitative indicators outlined in the Measure Result Template of the Green Line. Hence, the Tourist Kit strategy, which aims at replacing the courtesy buses that provide a service from the hotels to the city centre and thus overlap with regular public transport service, will be part of this study.



## 2.1. Cost and benefit indicators

The following key costs and benefits are analysed:

- Operational costs of the hotels for deployment of the courtesy bus service,
- Operational costs of the public transport operator in setting up the Tourist Kit strategy,
- Emissions monetisation for the courtesy buses.

A **discount rate of 55% per year** is applied to all data in accordance with the guidelines on cost-benefit analyses (see Kraffel, V. et. al. (2010)).

## 2.2. Baseline and business-as-usual scenario

Before the implementation of MIMOSA, the Green Line catchment area (a 6 km long corridor) comprised a total of 42 hotels, 21 of which provide courtesy bus services. Some hotels belong to the same chain (mother company) and thus share a courtesy bus. A total number of 12 courtesy vehicles exist, 7 buses and 5 vans. The assumptions made in order to conduct the cost-benefit analysis will support a scenario in which all 21 hotels having provided courtesy bus services before CIVITAS would understand that the region is a high quality tourist destination and therefore relies on sustainable energy use. Thus they should convince their guests to choose the public transport service instead.

The business-as-usual scenario builds on the assumptions that without the Tourist Kit and the encouragement put forward by the public transport operator, no courtesy buses would stop providing service and thus the level of service would be the same as it was in 2008.

### 2.2.1. Operational costs of the hotels for the courtesy service

#### ***Fuel and maintenance Costs***

This courtesy service is performed, as previously said, by a fleet of 12 vehicles, 7 buses and 5 vans. On average, each trip is 9.6 km in length and each vehicle makes 86 daily trips (though buses often make more trips than vans). A rough estimation indicates that the overall number of vehicles is responsible for **a total of up to 228,220 km/year in the target area**. Regarding fuel consumption, courtesy buses consume 89,295 litres per

year, which in 2008 resulted in fuel costs of € 80,303,-. Additionally, it was assumed that the annual increase in costs for the courtesy buses until 2015 will be the same as the increase between 2008 and 2009.

### Costs for staff and depreciation of the buses

According to information provided by the hotels, **the staff costs** per year per hotel can be estimated at **€ 194,520,-. This is the money allocated to courtesy bus drivers.** Additionally **€ 64,750,-per year is the cost for the depreciation of the busses.**

**Table 2.2.1: Operational costs of the hotels with a courtesy bus service**

	Real figures				Estimated figures			
	2008	2009	2010	2011	2012	2013	2014	2015
Average length of a trip	9.6 km							
Km travelled by courtesy buses per year	228,220	228,220	228,220	228,220	0	0	0	0
Litres of fuel used	89,225	89,225	89,225	89,225	0	0	0	0
Fuel cost per litre	0.90 €	0.98 €	1.05 €	1.10 €	1.37 €	1.45 €	1.52 €	1.61 €
Total fuel costs	80,303 €	87,441 €	93,686 €	98,148 €	0 €	0 €	0 €	0 €
Depreciation costs of the courtesy buses	64,750 €	64,750 €	64,750 €	64,750 €	0 €	0 €	0 €	0 €
Staff costs	194,520 €	194,520 €	194,520 €	194,520 €	0 €	0 €	0 €	0 €
<b>Total costs for hotels</b>	<b>339,573 €</b>	<b>346,711 €</b>	<b>352,956 €</b>	<b>357,418 €</b>	<b>0 €</b>	<b>0 €</b>	<b>0 €</b>	<b>0 €</b>

## 2.2.2. Operational costs of the public transport operator to set up the Tourist Kit strategy

For the start of the tourist kit strategy (2010) it was assumed that two people would work an average of three days per month. For the following years this figure was reduced to an average of 2 days per month. The Tourist Kit itself includes a folder, a brochure and a sticker with the hotel's brand to stick to the public transport ticket. All this material has a unitary value of 0.75€<sup>7</sup>.

To evaluate the economic validity of this initiative, it was assumed that the public transport operator would not only continues to sell the same amount of tourist kits (1, 3 and 5 day tickets) as in 2011, but would also starts selling these tickets to tourists that would have previously chosen a courtesy bus (average of 739 persons a day).

**Table 2.2.2:** Operational costs and revenues of the public transport Operator with the Tourist Kit Strategy

	Real figures				Estimated figures			
	2008	2009	2010	2011	2012	2013	2014	2015
N.º of hotels selling Tourist Kits	0	0	10	19	27	27	27	27
Number of Tourist Kit tickets sold	0	0	3,408	5,022	274,757	274,757	274,757	274,757
Tourist Kit costs for the public transport operator material	0 €	0 €	2,556 €	3,879 €	218,617 €	225,176 €	231,931 €	238,889 €
Staff costs	0 €	0 €	8,582 €	5,722 €	5,722 €	5,722 €	5,722 €	5,722 €
<b>Total costs</b>	<b>0 €</b>	<b>0 €</b>	<b>11,138 €</b>	<b>9,601 €</b>	<b>224,339 €</b>	<b>230,897 €</b>	<b>237,653 €</b>	<b>244,611 €</b>
<b>Total revenues</b>	<b>0 €</b>	<b>0 €</b>	<b>19,719 €</b>	<b>29,568 €</b>	<b>2,073,130 €</b>	<b>2,187,152 €</b>	<b>2,307,445 €</b>	<b>2,434,354 €</b>
Revenues for the public transport operator from selling Tourist	0 €	0 €	18,973 €	28,449 €	1,994,678 €	2,104,386 €	2,220,127 €	2,342,234 €
Revenues for hotel receptionists for selling Tourist Kit	0 €	0 €	746 €	1,119 €	78,451 €	82,766 €	87,318 €	92,121 €

Since tourists do not have to comply with strict schedules and are more relaxed to enjoy what the city has to offer, they often travel during non-peak hours, when the occupation rates are lower. Thus the extra number of passengers from the courtesy buses can be easily accommodated.

<sup>7</sup> The material for Tourist Kit is actually co-funded by an ERDF project (2008-2013). For this calculation it is assumed that this material is not co-funded.

Nonetheless, to cope with the increasing demand of passengers, an **increase of 6 journeys a day was assumed**. This increased number of public transport journeys will also be considered for cost-benefit purposes, as follows:

**Table 2.2.3:** *Other operational costs of the public transport operator with the Tourist Kit Strategy*

	Real figures				Estimated figures			
	2008	2009	2010	2011	2012	2013	2014	2015
Number of additional trips/day	-	-	-	-	6	6	6	6
Number of additional trips/year	-	-	-	-	2,190	2,190	2,190	2,190
Number of additional km per year	-	-	-	-	21,900	21,900	21,900	21,900
Average operational cost per trip <sup>8</sup>	-	-	-	-	27.75 €	29.28 €	30.89 €	32.59 €
<b>Additional operational costs for the public</b>	-	-			<b>60,773 €</b>	<b>64,115 €</b>	<b>67,641 €</b>	<b>71,362 €</b>

### 3 CBA findings

#### Expected scenario

To evaluate the major project goals, MIMOSA has pursued a monetisation of all the indicators previously mentioned. The following table summarises these findings with respect to the emissions.

It was assumed that before the full scale implementation of the Tourist Kit (from 2008 to 2011) only 10% of Green Line demand (and 10% of trips) corresponded to tourists. Taking this scenario into account, 10% of the emissions of the Green Line corresponded to the emissions related to tourist demand.

<sup>8</sup> Average operational costs for the area where Green Line operates were used for the purposes of calculating these figures.

The total amount of emissions for the period 2012-2015 are a result of the 10% of trips related to the tourist demand plus the emissions associated with the additional 6 trips required to cope with the increase demand of passengers.

**Table 3.1. Emissions<sup>9</sup> monetization**

	Real figures				Estimated figures			
	2008	2009	2010	2011	2012	2013	2014	2015
<b>Green Line emissions (tonne)</b>								
CO2	146	140	134	128	152	152	152	152
NOx	1.49	1.35	1.22	1.08	1.09	1.09	1.09	1.09
PM2.5	0.05	0.04	0.03	0.03	0.03	0.03	0.03	0.03
<b>Courtesy busses emissions (tonne)</b>								
CO2	363	363	363	363	0	0	0	0
NOx	4.2	4.2	4.2	4.2	0	0	0	0
PM2.5	0.6	0.6	0.6	0.6	0	0	0	0
<b>Monetization</b>								
Recommended value for CO2/tonne	22 €	24 €	25 €	26 €	28 €	29 €	31 €	33 €
Recommended value for Nox/tonne	3,276 €	3,456 €	3,646 €	3,847 €	4,058 €	4,282 €	4,517 €	4,766 €
Recommended value for PM2.5/tonne	245,700 €	259,214 €	273,470 €	288,511 €	304,379 €	321,120 €	338,782 €	357,415 €
Total costs with CO2	11,445 €	11,926 €	12,426 €	12,945 €	4,230 €	4,462 €	4,708 €	4,967 €
Total costs with Nox	18,778 €	19,346 €	19,920 €	20,499 €	4,424 €	4,668 €	4,924 €	5,195 €
Total costs with PM2.5	170,343 €	177,466 €	184,856 €	192,523 €	9,587 €	10,114 €	10,670 €	11,257 €
<b>TOTAL</b>	<b>200,566 €</b>	<b>208,738 €</b>	<b>217,203 €</b>	<b>225,968 €</b>	<b>18,241 €</b>	<b>19,244 €</b>	<b>20,302 €</b>	<b>21,419 €</b>

All in all, if the 12 courtesy buses are stopped from providing this inefficient service, the main conclusions drawn from this analysis is that Funchal has a fairly good chance to shift the negative net values that were obtained up until 2011 and achieve a very positive net benefit in 2012 (see table 3.2.). Therefore the cost-benefit analysis clearly indicates that the city of Funchal should go ahead with the pre-conditions necessary to operate

<sup>9</sup> The emissions were calculated by an environmental engineer who works at the municipality of Funchal using COPERT 4 software.

such structural changes, namely the negotiation of a compulsory scheme to curb access to the city centre for courtesy buses<sup>10</sup>. Local and regional authorities, the public transport operator and hotel managers should realise that everyone can profit from the full potential of the Tourist Kit.

To cater to the interests of all the parties involved, one should outline that Horários do Funchal might earn a significant amount of money every year; whereas hotels can win commissions for acting as a selling point for public transport tickets. Emission savings should also be meaningful. It is expected that by 2015 the total costs for the three pollutants selected will be far less than in 2008, regardless of the discount rate of 5.5% a year. Last but not least this measure contributes to the reduction in transport related emissions. Funchal expects to decrease emissions by a total of 339 Tons of CO2 per year.

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<sup>10</sup> As stated in the introduction, most of the hotels have an agreement with big tourism agencies in which a courtesy bus to the city centre is a requirement.

Table 3.2. Expected scenario

	Real figures				Estimated figures			
	2008	2009	2010	2011	2012	2013	2014	2015
<b>HF</b>								
Costs			11,138 €	9,695 €	295,853 €	311,810 €	328,645 €	346,405 €
Revenues			18,973 €	28,449 €	1,994,678 €	2,104,386 €	2,220,127 €	2,342,234 €
<b>Revenues - Costs</b>			7,834 €	18,754 €	1,698,826 €	1,792,576 €	1,891,482 €	1,995,828 €
<b>Hotels</b>								
Costs	339,573 €	346,711 €	352,956 €	357,418 €	0 €	0 €	0 €	0 €
Revenues	0 €	0 €	746 €	1,119 €	78,451 €	82,766 €	87,318 €	92,121 €
<b>Revenues - Costs</b>	-339,573 €	-346,711 €	-352,210 €	-356,299 €	78,451 €	82,766 €	87,318 €	92,121 €
<b>Society - emission costs</b>								
CO2	11,445 €	11,926 €	12,426 €	12,945 €	4,230 €	4,462 €	4,708 €	4,967 €
NOx	18,778 €	19,346 €	19,920 €	20,499 €	4,424 €	4,668 €	4,924 €	5,195 €
PM2.5	170,343 €	177,466 €	184,856 €	192,523 €	9,587 €	10,114 €	10,670 €	11,257 €
<b>Sub-total of emission costs</b>	200,566 €	208,738 €	217,203 €	225,968 €	18,241 €	19,244 €	20,302 €	21,419 €
<b>Net Benefit (Revenues -Costs)</b>	<b>-540,138 €</b>	<b>-555,449 €</b>	<b>-561,579 €</b>	<b>-563,512 €</b>	<b>1,759,036 €</b>	<b>1,856,098 €</b>	<b>1,958,498 €</b>	<b>2,066,530 €</b>
Discounted Net Benefit (2008)	-540,138 €	-526,492 €	-504,552 €	-479,895 €	1,419,924 €	1,420,164 €	1,420,393 €	1,420,609 €
Total Discounted Net Benefit (2008)					4,696,643 €			

**BAU scenario**

To analyse the potential effects of this measure the results of the expected scenario were compared to the Business-as-Usual scenario. The BAU scenario comprises a scenario in which hotels continue to provide a courtesy bus service to their customers in order to raise their satisfaction with the hotel chosen. But this scenario results in a negative net present value. The reasons for this result are that more traffic is generated and thus more pollutants are emitted whilst hotels have to deal with extra-costs to maintain courtesy bus services.



Table 3.3. BAU scenario

	2008	2009	2010	2011	2012	2013	2014	2015
<b>HF</b>								
Costs	0 €	0 €	0 €	0 €	0 €	0 €	0 €	0 €
Revenues	0 €	0 €	0 €	0 €	0 €	0 €	0 €	0 €
<b>Hotels</b>								
Costs	339,573 €	346,711 €	353,999 €	361,440 €	369,037 €	376,795 €	384,715 €	392,802 €
Revenues	0 €	0 €	0 €	0 €	0 €	0 €	0 €	0 €
<b>Society - emission costs</b>								
<b>Sub-total of emission costs</b>	200,566 €	211,597 €	223,234 €	235,512 €	248,466 €	262,131 €	276,548 €	291,759 €
<b>Net Benefit (Revenues -Costs)</b>	<b>-540,138 €</b>	<b>-558,307 €</b>	<b>-577,233 €</b>	<b>-596,952 €</b>	<b>-617,503 €</b>	<b>-638,926 €</b>	<b>-661,264 €</b>	<b>-684,561 €</b>
Discounted Net Benefit (2008)	-540,138 €	-529,201 €	-518,616 €	-508,373 €	-498,459 €	-488,864 €	-479,579 €	-470,592 €
Total Discounted Net Benefit (2008)								-2,964,483 €

**Expected scenario versus BAU scenario**

Table 3.4 provides a general review of the impact of the expected scenario against the business-as-usual scenario:

**Table 3.4. Expected - BaU**

	2008	2009	2010	2011	2012	2013	2014	2015
<b>HF</b>								
Costs	0 €	0 €	11,138 €	9,695 €	295,853 €	311,810 €	328,645 €	346,405 €
Revenues	0 €	0 €	18,973 €	28,449 €	1,994,678 €	2,104,386 €	2,220,127 €	2,342,234 €
<b>Revenues - Costs</b>	<b>0 €</b>	<b>0 €</b>	<b>7,834 €</b>	<b>18,754 €</b>	<b>1,698,826 €</b>	<b>1,792,576 €</b>	<b>1,891,482 €</b>	<b>1,995,828 €</b>
<b>Hotels</b>								
Costs	0 €	0 €	-1,042 €	-4,022 €	-369,037 €	-376,795 €	-384,715 €	-392,802 €
Revenues	0 €	0 €	746 €	1,119 €	78,451 €	82,766 €	87,318 €	92,121 €
<b>Revenues - Costs</b>	<b>0 €</b>	<b>0 €</b>	<b>1,788 €</b>	<b>5,141 €</b>	<b>447,489 €</b>	<b>459,561 €</b>	<b>472,033 €</b>	<b>484,923 €</b>
<b>Society - emission costs</b>								
<b>Sub-total of emission costs</b>	<b>0 €</b>	<b>-2,859 €</b>	<b>-6,031 €</b>	<b>-9,545 €</b>	<b>-230,225 €</b>	<b>-242,887 €</b>	<b>-256,246 €</b>	<b>-270,340 €</b>
<b>Net benefits(Revenues -Costs)</b>	<b>0 €</b>	<b>2,859 €</b>	<b>15,654 €</b>	<b>33,440 €</b>	<b>2,376,539 €</b>	<b>2,495,024 €</b>	<b>2,619,762 €</b>	<b>2,751,091 €</b>
Discounted net benefits (2008)	0 €	2,709 €	14,065 €	28,478 €	1,918,382 €	1,909,029 €	1,899,971 €	1,891,201 €
Total NPV (2008)					7,661,126 €			

Overall, Horários do Funchal, the public transport operator, will be able to achieve meaningful revenues, earning up to 2.3 million Euros by 2015 with a low-investment of € 346,405 - in the same year, mainly used to reinforce the actual public transport service and to produce additional material for the Tourist Kit. One of the success factors in Funchal for this approach is the encouragement given to hotel receptionists. According to the cost-benefit analysis, they can earn as much as € 92,121, by 2015 just by selling tickets whilst the hotel industry (27 hotels) can save roughly € 400,000 - a year by 2015 with respect to the courtesy bus service which would no longer be provided.

### 3.1 Indirect impacts

In the previous section it became clear that the Tourist Kit fits any local strategy aiming to substitute unwanted courtesy bus traffic with regular public transport service. But it is equally important to outline the indirect impacts this measure can have and that were neither measured nor calculated in this cost-benefit evaluation:

- Hotels may advertise themselves to support sustainability;
- Locals would have extra public transport journeys and therefore would feel more satisfied with the local public transport service in relation to frequency of service.

### 3.2 Sensitivity analysis

For the sensitivity analysis it was decided to ‘test’ two scenarios which are on the lower/upper end of the expected outcomes. These scenarios are:

#### Scenario 1:

- assuming that the fuel cost increases 2% per year, and consequently:
- Only 50% of the hotels who did not adhere to the Tourist Kit by 2012, will adhere in the next few years (6 hotels);
- The number of operating courtesy buses would be half the number presented in the reference scenario;
- The staff costs before 2012 correspond to an average of one day per month for two persons;
- HF only added an extra 3 journeys per day.

Hotel owners are businessman, so for the purpose of a sensitivity analysis we decided to test a scenario in which hotels were not compelled to stop the provision of a courtesy bus service since the fuel costs would not rise as much as in the expected scenario. This results in a **net present value of 3,578,323€** (corresponding to a difference between the after and the business-as-usual scenario).

**Scenario 2:**

- Double the commission paid to hotel staff;
- Motivated by appealing commissions, all hotels along the Green Line catchment area would provide the Tourist Kit;
- The Green Line would have to reinforce the service with 20 additional trips to accommodate the surplus of passengers;
- The staff costs before 2012 correspond to an average of four days per month for two persons.

This optimistic scenario would lead to a net present value of almost 10 million Euros by 2015. This economic outcome is particularly favourably to hotel staff since they can see a complementary subsidy for their wages in green and smart mobility policies.

All in all, a comparison between the three scenarios is depicted in the following table:

**Table 3.5.** *Comparing the scenarios NPV*

<b>Beneficiary</b>	<b>Total After-BAU</b>	<b>Expected scenario</b>	<b>Scenario 1</b>	<b>Scenario 2</b>
HF	Costs	972,138 €	491,830 €	1,838,990 €
	Revenues	6,481,825 €	3,320,409 €	10,059,909 €
	Revenues - Costs	5,509,687 €	2,828,579 €	8,220,919 €
Hotels	Costs	-1,139,594 €	-598,873 €	-1,139,594 €
	Revenues	254,932 €	130,593 €	395,659 €
	Revenues - Costs	1,394,525 €	729,466 €	1,535,252 €
Society	Emissions costs	-756,913 €	-402,445 €	-745,415 €
<b>Total</b>		<b>7,661,126 €</b>	<b>3,960,491 €</b>	<b>10,501,586 €</b>

## 4 Conclusions from the CBA

It is recommended that the reader bears in mind that when curbing the access of courtesy bus services to the city centre, tourists can decide to take a taxi or even walk rather than choosing public transport. On the other hand, there are a lot of hotels that neither provide courtesy services nor sell Tourist Kits which can join this scheme in the future if they realise how much they can earn with it. These two alternatives counteract and by neutralising each other they make the scenario developed here for cost-benefit purposes a realistic one.

In conclusion, assuming that 21 hotels stopped providing courtesy services (adding up to a total of 27 participating hotels) and instead started to encourage their guests to hop on the Green Line:

- The Tourist Kit and the promotion of public transport in hotels would be responsible for a decrease of 228,220 inefficient km/year travelled by courtesy buses. This is equal to roughly 90,000 litres of fuel saved.
- If the frequency of the Green Line were to slightly increase to accommodate former courtesy-bus clients, evidence shows that fewer tons of CO2 would be emitted (-339 tons/year).
- Hotel industry could benefit an extra € 92,121,- in one year only (2015) in commissions by selling public transport tickets while hotel owners could save roughly € 400,000 - a year by the end of the project lifetime (2015) in operational costs of their hotel. This is definitely an important lure for both of them.
- The net present value of this CIVITAS measure outweighs the business-as-usual scenario by € 7,661,126-.

For the sensitivity analysis, two types of experimental scenarios were developed and tested. The first set of scenarios assumed that the fuel costs would increase at a lower pace, which would mean that hotel owners would not be so motivated to stop providing courtesy bus services. Nonetheless, the net present value that resulted from this scenario was still fairly positive, roughly 4.0 million Euros. In the other scenario, the commission paid to hotel staff would increase a lot, which would lead to more hotels acting as selling points for public transport. The net present value would amount to almost 10.5 Million Euros in this scenario.

Consequently there is evidence that the Tourist Kit is thus a bold and forward-looking policy which can strengthen Europe's role as the world's leading region in tourism.

## REFERENCES

**Kraffel, Veronique, et al. (2010)** *Guideline for Focused Measure Cost-Benefit Analysis in CIVITAS MIMOSA*. Berlin: Berlin Institute of Technology

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