

2020
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Measure Evaluation Result

LIM 7.3 - PT traveller information system

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Executive summary

The main goal of this measure was related to the deployment of an integrated telematic system with real time information. The solution included the installation of 25 bus stop electronic displays with photovoltaic technology along the sea-side road which connects the tourist area to the city and the old town, informing people about the waiting time for the next bus. The electronic information displays also provide tourist information about next bus stops as well as nearby attractions and events. In addition, the solution included the installation of 25 additional onboard TFT displays inside the buses to inform the PT users about the following stops, the end of the route and provide information for nearby points of interest and upcoming events. The system was designed targeting both tourists and residents, making their public transport (PT) leisure trips more efficient in terms of time and comfort. The PT information panels are user friendly, since along with the PT information, can provide passengers the opportunity to plan their transportation in Limassol city.

The central system installed provides the relevant information based on GPS sensors on the buses and the necessary software. The system is located at the Limassol Bus Company offices and it is operated and maintained by the company.

During the 4 years of the project, the stakeholders' engagement helped the measure to be successfully completed by providing authorisations, specifications and a strong collaboration. Specifically, the Ministry of Transport, Communication & Works has worked very closely with the Limassol Tourism Board (LTC) by providing these authorisations and system specifications in order to make the displays compatible with its system. Close collaboration with the system contractor ensured the good operation of the system. In addition, on 19 August 2019 a memorandum was signed to ensure this strong collaboration, and as such, any information needed for the impact evaluation of this measure was easily obtained.

This measure significantly upgraded the quality of the PT service and increased its attractiveness both for tourists and residents that travel along the sea-side road (20 km) and generally in the Limassol Region. It is expected that the use of private/rental car or taxi hiring is reduced in favour of PT based on the results of LIM 7.1, in which it was assessed that among the surveyed people 57.1% had already accepted the improvements of PT and used the PT.

With the implementation of LIM7.3 and LIM7.1, the satisfaction with the PT transport system achieved 95% of positive answers in 2019. The awareness level about the electronic displays in and out the bus reached 75% of the surveyed population, while 100% had accepted the electronic displays in and out the buses and would like to find more installed displays in the rural and urban areas of Limassol region.

Data were successfully collected, allowing the evaluation of this measure to be completed on time. The process for collecting the data and fulfil the measure requirements was achieved without facing significant barriers. After the completion of this measure and since this system is a significant upgrade for PT, the Limassol Bus Company is willing to continue the operation and extend the system as it is expected that this will make the service more attractive and increase the number of PT users.

A Description

The main goal of this measure consisted in the deployment of an integrated telematic system with real time information. The main action was implemented with the preparation of the procurement procedure, according to National Law, for purchasing and installing 25 onboard TFT displays on buses and 25 displays with photovoltaic technology at the bus stops. The procurement process was completed on June 2019 and on September 2019 LTC and the selected company signed the contract in the presence of the Minister of Transport, Communication & Works.

The selected company proceeded with the installation of 25 displays at bus stops to provide real-time information to passengers, the creation of a central system and the necessary software to provide the relevant information based on GPS sensors on the buses and the installation of 25 onboard TFT displays for location-based information inside buses, informing the PT users about the following stops, the end of route, upcoming events and important landmarks of the city; finally, the contractor installed a content Management System in LTC' offices – a back office tool to provide information about the POI (Points of Interest), nearby attractions and upcoming events. The system has been designed for both tourists and residents in mind, making their travelling using PT more efficient in terms of time and comfort.

A1 Objectives and outputs

City policy level objectives

This measure is in line with the Limassol Municipality's Strategy according to the measure Sustainable Tourist Mobility Action Plan contributing to the objectives below:

- Less CO₂ emissions
- Less traffic noise in the city centre
- Less energy consumption
- Save fuel/money
- Improve public health and safety
- Increase the total share of citizens that use sustainable mobility modes
- More Attractive tourist destination
- Change habits of local people and tourists

Measure Specific objectives

- Upgrade urban PT services
- Increase interest and use of PT service
- Provide travelling information to people waiting for the bus
- Provide tourist information to people waiting for the bus
- Provide travelling information while on the bus
- Provide tourist information while on the bus
- Provide sustainable mobility information while on the bus (i.e. bike racks on buses, nearest bike sharing station to the next stop)

Outputs

- 25 electronic strolling signs in buses serving the tourist area
- 25 electronic signs at bus stops with photovoltaic technology serving the tourist area towards the old town
- Web Content Management System

Supporting activities

The traveller system has been installed with the cooperation and assistance of the Limassol Bus Company and the system will be maintained by them in the long run.

The Department of Road Transport has provided the necessary specifications and permits, the Ministry of Transport, Communications and Works has approved and supported this effort and encouraged expansion of the system all over Limassol and in other regions of Cyprus as well and local authorities have provided support in determining the bus stops to be upgraded, electricity, technical service and other support to complete this measure starting from the tourist area to the old town.

A2 Inter-relationship with other measures

The measure shares some synergies and has a strong interaction with the CIVITAS DESTINATIONS measure as follows:

- **LIM 6.2:** *Combined tourist and mobility products: Green Label Award and Tourist Mobility Card.* The new installations developed under measure LIM 7.3, enhance the usefulness of the development of the *Tourist Mobility Card* of measure 6.2.
- **LIM 7.1:** *Improvement of PT routes, timetables, ticket procedure and bike transportation on buses to make the service more attractive,* as information are provided to travellers for bike racks, routes and end of the route by the application of displays on buses developed under the examined measure. Additionally, LIM 7.1 and LIM 7.3 share results for one indicator (Satisfaction with PT transport system).
- **LIM 7.4:** *Mobility application and travel planner for smart phones to provide real time information,* as both measures aim to help travellers plan more efficiently their trips by PT and improve their experience.

A3 Target groups and/or affected part of the city or region

Tourists and residents moving across the region will be influenced by this measure.

A4 Stakeholders involvement

Stakeholder name	Activities description
Limassol bus company	The traveller system will be installed with their cooperation and assistance and the system will be maintained in the long run by them

Department of road transport	to provide the necessary specifications and permits
Ministry of Communications and Works	To approve and support this effort and encourage expansion of the system all over Limassol and in other regions of Cyprus as well.
Local authorities	to provide support in determining the bus stops to be upgraded, provide electricity, technical service and other support to materialise this measure starting from the tourist area to the old town.

Table 1: Stakeholder's involvement

B Measure implementation

B1 Situation before CIVITAS

The lack of information about the waiting period at the bus stop and the lack of consistency in terms of time intervals have been reasons for residents and tourists not using the PT service. Also, while on the bus, there was no available information on the next stop and bus stops were not easily identifiable by their names. Visitors have been asking the driver to notify them when they reach the bus stop of their choice. This measure increases attractiveness and effectiveness of the PT service and also achieves integration with tourism, since tourist information as well as sustainable mobility information is also be provided through this PT traveller information system.

B2 Innovative aspects

- **New conceptual approach** - This measure informs tourists on the waiting time at the bus stop and the following stops, the end of the route, bikes on buses and other important travelling information while on the bus. The service makes the PT more attractive and user friendly. The Display has been designed to show multimedia files for campaigns and Points of Interest (POI), stops, campaigns, logos, date/time, and route names and codes.
- **Use of new technology** - Another innovative solution is the Web Content Management System. It is a web-based application that allows the configuration of parameters on the multimedia data base that needs to be shown on the on-board display. It allows the selection of specific content for the on-board displays. The Web Content Management System allows all text messages and information to be uploaded to the displays either as text messages or videos/photos and monitors the status of the communication. A campaign or event can be scheduled at a particular time and duration and uploaded to the displays of all fleet or selected vehicles. Additionally, the system with the 25 Bus Stops Displays installed in Limassol Region brings a new dimension into public transport information.

B3 Technology development

- Information is collected from GPS sensors on urban buses

- A central system manages information sent to electronic signs at bus stops
- Electronic signs at bus stops provide arrival times and tourist information about the nearest attractions, events/festivals etc
- Electronic signs in buses provide information about the next stop, end of the route, sustainable mobility information and tourist information

B4 Actual implementation of the measure

During the four years of the project, several meetings were held with the Department of Public Works of the Ministry of Transport, Communication and Works (MTCW) in order to gain the appropriate authorisations and specifications for the displays to be compatible with the national system. Also, the LTC and the Department of Public Works worked very closely during the development and the installation of the system as they participated in all meetings with the selected company between 2018 and 2019. Finally, municipalities and communities of the Limassol Region were involved in order to give their permission for the displays to be installed at bus stops within their boundaries.

The installation of 25 electronic displays with photovoltaic technology at bus stops took place during November 2019. Also 25 on board Thin Film Transistor (TFT) displays have been installed for the location information inside buses, informing the PT users about the following stops, the end of route and information regarding major events and points of interest in Limassol. Moreover, a content Management System – Back Office Tool has been installed in LTC's offices in order to provide information about POI, nearby attractions and future events. The system has been designed in English and Greek.

The system with the **25 electronic displays with photovoltaic technology** for PT installed in Limassol Region brings a new dimension into public transport information. The system is based on bi-stable technology, requires power only on display update of information, thus, its power source is a small solar panel adequate to achieve autonomy for many days (i.e., 72 hours of autonomy without backlight in the display and 1 route announcement when bus arrived) even in unfavourable solar radiation conditions. Bus stop displays are able to provide accurate information about estimated bus arrivals at the respective bus stops. This shall show the estimated time based on the information received from the PT telematics through SIRI. The displays show the information in two languages (English/Greek) and their interface is capable to show estimated time of arrival/departure in real time. The display, also, provides information regarding the route number, destination and bus stop name.



Figure 1: Displays at bus stops with PV technology

The TFT displays have been designed to show multimedia files for campaigns and POI, depending on priorities that have been provided through the Content Management System (CMS). The CMS is used for assigning multimedia content files, configuration of the parameters for the multimedia and to send text messages to the on-board display and bus stop solar display. The Operator can use this application to inform passengers on buses and at bus stops for specific conditions such as traffic congestions.



Figure 2: Web Content Management System

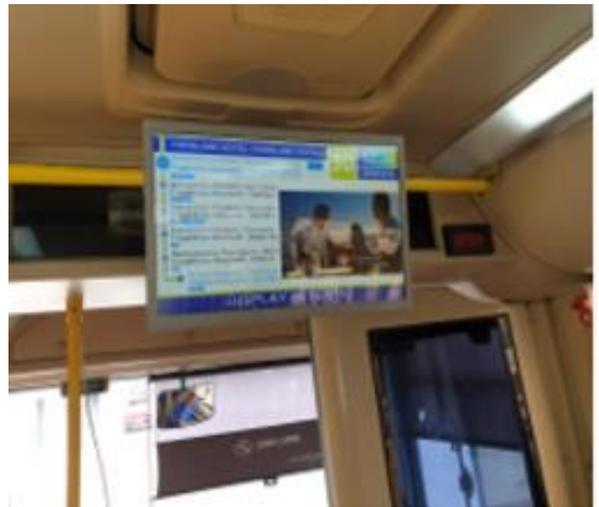


Figure 3: TFT displays inside Limassol Buses

C Impact evaluation

C1 Evaluation approach

Expected impacts and indicators

Impact category	Impact indicator	Unit of measure
Society	1- Satisfaction with PT transport system	%
Society	2- Awareness level about the electronic displays in and out the bus	%
Society	3- Acceptance level about the electronic displays in and out the bus	%

Table 2: Expected impact and indicators

Method of measurement

Impact indicator	Method*	Frequency			Target Group	Domain (demonstration area/city)
		Bef.	Dur.	Aft.		
1- Satisfaction with PT transport system	S	n.a.	21-26	34-41	Residents and tourists	City
2- Awareness level about the electronic displays in and out the bus	S	n.a.	n.a.	34-41	Residents and tourists	City
3- Acceptance level about the electronic displays in and out the bus	S	n.a.	n.a.	34-41	Residents and tourists	City

*(Data collection (DC), Estimation (E), Survey (S))

Table 3: Method of measurement

Detailed description of the indicator methodologies

- **1 Satisfaction with PT transport system** – The responsibility for collecting data for this indicator lied with Stratagem. The indicator aimed to assess the percentage of satisfied people with the improved PT to move around Limassol. The answer was extracted from 350 surveys carried out in 2018 (172 tourists; 3 locals) and 2019 (175 tourists). This indicator reflects the result of the cumulative actions from LIM 7.1 and 7.3. The Electronic Bus Stop were developed during November 2019 and therefore people who answered the questions in 2018 did not consider the telematic system as they had not seen it yet. While in the results of the questionnaires received till M41 (part of the answers of the questionnaires of 2019) the surveyed people were aware of the telematic system and therefore their satisfaction level was reflected in their answers.
- **2) Awareness level about the electronic displays in and out the bus and 3) Acceptance level about the electronic displays in and out the bus-** The responsibility for collecting data for this indicator lied with Stratagem. This indicator aimed to assess the percentage of the 175 surveyed tourists in 2019 who had noticed the displays and are happy to see them installed. More specific this indicator is answered by the questions “Did you noticed the displays in and out the buses?”, “Do you like to have access to this shared information through the displays?”, “Would you like to see more displays?”.

The Business-as-Usual scenario

Considering the type of indicators, mostly comprised of surveys and indicators whose information was gathered for the first time, carrying out a BAU analysis was not possible. However, in case that the displays would not have been implemented, the PT passengers would not be able to be informed about the end of their routes, arrival times and next stops.

C2 Measure results

Impact category	Impact indicator	Unit of measure	Baseline	Ex-Ante	Ex-Post
Society	1- Satisfaction with PT transport system	%	-	40	95
Society	2- Awareness Level about the electronic displays in and out the bus	%	-	40	75
Society	3- Acceptance Level about the electronic displays in and out the bus	%	-	40	100

Table 4: Measure results

C2.1 Society

1- Satisfaction with PT transport system

As mentioned, the result of this indicator reflects the result of the actions implemented under LIM 7.1 and LIM7.3.

From the surveyed people, 90% in 2018 and 95% in 2019 answered that were very satisfied with the improved PT system of Limassol city. People seemed to be satisfied with the combination of their leisure trip together with cycling as well as the free Wi-Fi services installed on the buses. Additionally, people seemed to be very satisfied with the improved PT routes and timetables which is a very important factor affecting the increase of people's satisfaction as people knows the time that the bus is coming and do not waste time.

During November 2019, the electronic bus stop displays had been installed in Limassol. Therefore, the survey results of 2019 reflect also people's satisfaction on the installation of the electronic bus stop displays which provides the passengers with real time information as well as the installation of the onboard TFT Displays providing location-based information inside buses informing the PT users (especially tourists) about the following stops, so that they know where to get off the bus, the end of route and ticket purchasing.

The increase of the satisfaction level of people between the first and the second survey might be due to the addition of the telematic system which led people to be even more satisfied with the improvements.

2- Awareness level about the electronic displays in and out the bus

75% of the 175 surveyed tourists and residents answered that they had noticed and therefore are aware of the displays in and out of the buses.

3- Acceptance level about the electronic displays in and out of the bus

In 2019 100% of the people answered that they were very happy and therefore had accepted the electronic displays in and out of the buses. Additionally, 100% of the people answered that they would like to see more displays installed by. It is very important to note that not even one person answered negative in the questions, meaning that people of Limassol region were really in need

of such a development. People seemed to like so much the displays that they would like to see them in each bus stop in the rural and urban region of Limassol.

C3 Quantifiable targets

No.	Target	Rating
1	Reduce CO ₂ emissions: 1756 tCO ₂	N/A
2	Reduce traffic noise in the city centre: 30 dB	N/A
3	Less energy consumption: 2916 MWh	N/A
4	Less fuel costs: 453600 €	N/A
5	Less fuel consumption: 324000 L	N/A
6	*Increase the satisfaction level of people with PT transport system by 40%	***
7	*Increase the awareness level about the electronic displays in and out the bus: by 40%	***
8	*Increase the acceptance level about the electronic displays in and out the bus; by 40%	***
9	Reduced private/rental car usage or taxi hiring: 18000 people/ 6480000km	*
10	Increase the total share of citizens that use smarter and more fuel-efficient mobility modes	*
11	Public health and safety	*
12	Change habits of local people and tourists	*
13	More attractive tourist destination	*
<p>N/A = Not Assessed 0 = Not Achieved * = Substantially achieved (at least 50%) ** = Achieved in full *** = Exceeded</p>		

*New target, not in GA

Table 5: Assessment of quantifiable targets

Targets 1 to 5 and 9 to 13 were planned in the Grant Agreement, but Targets from 6 to 8, were new targets adapted to the scope of the measure. In the evaluation phase, after having implemented the actions envisaged in the measure, it became clear that the impacts indicated in the GA were not possible to quantify, although they would have been reached to a certain extent. In addition, Targets 1 to 5 were not assessed specifically under this measure because it was not

possible to monitor the reduction on fuel consumption and cost, CO₂ emissions and energy consumption and noise pollution related to the deployment of the PT traveller information system. Considering, however, the success of the upgrade of the PT information system, it was understood by the local partners that LIM 7.3 contributed to the common indicators related with CO₂ emissions, energy consumption, noise pollution, fuel cost and consumption, by making PT more attractive and contributing to the use of such transport mode. In any case, the local partners evaluated these indicators under LIM 3.1, LIM 4.1, LIM 4.2, LIM 5.1, LIM 6.3 and LIM 6.4. It should be noted that the results achieved at site level for these indicators reflect the cumulative effect of the implementation of all DESTINATIONS measures.

Targets 6, 7 and 8 were not initially planned in the Grant Agreement. Target 6 “Increase satisfaction with PT transport system” was exceeded. People were satisfied by 95% in 2019 of the use of PT transport system and this was expected considering that people are currently enjoying in combination with their leisure trips, cycling, free Wi-Fi services on buses, improved PT routes and timetables as well as the telematic systems installed on bus stops and inside buses for informing passengers (results reflect the actions of LIM 7.1 and 7.3).

Target 7 “Awareness Level about the electronic displays in and out the bus” was exceeded, as from the 175 surveyed tourists and residents, the 75% were aware of the displays in and out the buses, 35% more than what was expected.

Target 8 “Acceptance Level about the electronic displays in and out the bus” was exceeded as 100% of the surveyed population had accepted the electronic displays in and out of the buses and would like to see more installed displays in the rural and urban areas of the Limassol region.

Target 9 “Reduced private/rental car usage or taxi hiring: 18.000 people/ 6.480.000km” was also planned in Grant Agreement but was not possible to be assessed due to the limitation of obtaining such statistical data. Although the targets to increase the acceptance, awareness and satisfaction levels of people have been fully achieved, it is very difficult to know the exact number of private/rental car usage or taxi hiring that occurred during the project’s lifetime. It is assumed that these numbers decreased during the CIVITAS DESTINATIONS project implementation, having as evidence the results of LIM 6.1. In fact, this indicator is partially answered in LIM 6.1 considering that the people surveyed answered in indicator 4 “Increase the total share of citizens that use sustainable mobility modes for visiting touristic destinations” that they had decreased the use of private/rental cars and taxis to travel to a touristic destination between 2018 and 2019 as the graph below depicts. Therefore, considering the graph below it can be assumed that the measure was at least substantially achieved.

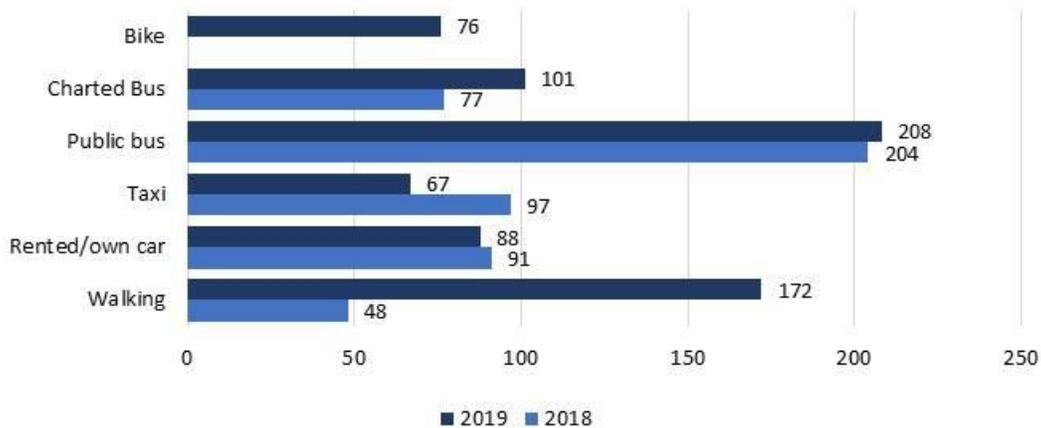


Figure 4: Trend of transportation modes between 2018 and 2019 (Number of residents and tourist) (repeated graph from LIM 6.1).

Target 10 “Increase the total share of citizens that use smarter and more fuel-efficient mobility modes” was initially planned in the Grant Agreement but it was not possible to be quantified. However, the local partners consider that the target has been Substantially Achieved as all the activities carried out under this measure and the interrelated measures (analysed in section A2) lead to an increase of the use of PT which is considered a more fuel-efficient mobility mode due to transferring a lot of people at once (mass travelling). Additionally, as it has been explained before in Target 9, the LIM 6.1 MER included indicator 4. This indicator explained the trend of the transportation modes to reach a touristic destination and as the graph depicts, people use more the sustainable modes of transportation in 2019 compared to 2018. Considering the indicator 4 from LIM 6.1 it can be concluded that the measure had been at least substantially achieved.

Target 11 “Public health and safety” was not possible to be quantified but the local partners claimed that the use of PT transport instead of cars or taxis will lead to a cleaner environment which contributes to public health as well as safer roads and therefore this measure has been at least substantially achieved. The interrelated measures referred on section A2 have also contributed to at least achieve this indicator.

Regarding target 12 “Change habits of local people and tourists”, it was not possible to perform a complete evaluation of the target as it was not possible to specifically assess the change of habits of residents or locals. In general, the results of indicator 12 revealed that people have changed habits between 2018 and 2019 as people got more educated through the campaigns, competitions, events of the interrelated measures and turned to sustainable mobility solutions for their transportation (verified in Figure 4). Hence, the local partners consider that the upgrade of the travelling information systems of PT’s contributed to change the habits of locals and tourists at least substantially.

Target 13 ‘More attractive tourist destination’ was not possible to be quantified but the local partners consider that the target has been Substantially Achieved as all the activities carried out under this measure and the interrelated measures (analysed in section A2) implemented during the DESTINATIONS project contributed to a more attractive tourist destination. The measures

added value to the city as the upgrade of the travelling information system turned people to use the PT to move around the region which overall improved the air and noise pollution of Limassol city centre. Additionally, the infrastructure that was developed under this measure and the interrelated measures made tourists' leisure travelling and mobility options more convenient, which is a very important consideration for visitors.

C4 Up-scaling of results

Not applicable

D Process Evaluation Findings

D1 Drivers

During the 4 years of the project, the stakeholders' engagement helped the measure to be successfully completed as they gave the necessary authorisations, specifications and a strong collaboration in order for the measure to be completed. Specifically, the MTCW worked very closely with the Limassol Tourism Company by providing authorisations, specifications to make the displays to be compatible with its system and close collaboration with the selected company for the good operation of the system.

LTC and the Ministry of Transport, Communication and Works signed on 19 August 2019 a memorandum that extends this strong collaboration into the future, thus any information needed for the impact evaluation of this measure was easily provided.

D2 Barriers

After the installation of the 25 displays at bus stops, some technical problems were identified due heavy rains. Some of the displays had problems with water leaking but the contractor found a solution: they proceeded with the refurbishment work on the flags and the replacement of the damaged components with available spare parts. Fortunately, all outputs have been completed on time, therefore data was collected and analysed, allowing the evaluation of this measure to be completed on time.

D3 Main Lessons Learned

Residents and tourists are very satisfied with the installation of displays because the information given is accurate. The TFT Displays include a text communication provided by the Content Management System, connecting routes information in intermediate stops, multimedia content such as lines, routes, POI, stops, campaigns, logos, date/time, and route names and codes. Residents and tourists value the PT real time information systems, which reflects on their satisfaction with the PT service.

E Evaluation conclusions

The measure was very well implemented and on time, although some difficulties were faced at the beginning of the tendering process due to lack of interest. The selected company, however, responded on time according to the timeline and addressed and solved immediately the problems created.

F Additional information

F1 Appraisal of evaluation approach

Data was successfully collected, allowing the evaluation for this measure to be completed on time.

The indicators related to the CO₂ emissions, energy consumption, noise pollution, fuel costs and savings has been planned to be assessed but since this measure aimed to upgrade the PT traveller information system, it was impossible to assess these targets (Targets 1 to 5). However, it is expected that these targets have been achieved under LIM 3.1, LIM 4.1, LIM 4.2, LIM 5.1, LIM 6.3 and LIM 6.4. It should be noted that the results achieved at site level for these indicators reflect the cumulative effect of the implementation of all DESTINATIONS measures.

Additionally, it was planned to assess the decrease in private/rental car usage or taxi hiring but unfortunately it was not possible to assess this indicator due to the limitation of not having official statistical data. However, an indicator of LIM 6.1, lead to the conclusion that there was a reduction of the private/rental car usage or taxi hiring.

Moreover target 10 (Increase the total share of citizens that use smarter and more fuel-efficient mobility modes), 11 (Public health and safety), 12 (Change habits of local people and tourists) and 13 (More attractive tourist destination) were not possible to be quantified, it is however expected that have been substantially achieved. This conclusion arises from the successful implementation of the other interrelated measures (section A2).

F2 Future activities relating to the measure

This measure will turn into a business case and will be operated and maintained for the years to come by the Limassol Bus Company. Since this system is a significant upgrade for PT, the Limassol Bus Company is willing to undertake the operation and extend the system as this is expected to make the service more attractive and increase the number of PT users.