2020 CiViTAS
Cleaner and better transport in cities

DESTINATIONS

D5.3

Implementation and demonstration report on smart and clean urban freight measures

Deliverable No.:	D5.3
Project Acronym:	DESTINATIONS
Full Title: CIVITAS DESTINATIONS	
Grant Agreement No.:	689031
Workpackage/Measure No.:	WP5
Workpackage Title: Smart and clean urban freight logistics at tourist destinations	
Responsible Author(s): Cláudia Henriques, Rúben Figueira (AREAM)	
Responsible Co-Author(s): **Madeira**: Augusto Vieira (CMF), Andreia Quintal (HF) **Rethymno**: Maria Aryblia, Stavroula Tournaki (TUC), Thomas Papadogiannis (RETH) **Elba**: Giorgio Ambrosino (MemEx), Antonio Liberato (MemEx), Massimiliano Ribaudo (PF), Federica Andreucci (PF), Lida Martorella (RIO); Marco Castellani (RIO) **Limassol**: Christina Kanellaki (LTC) **Las Palmas**: Jordi Casas (Cinesi), César García (SAGULPA) **Malta**: Ritianne Buhagiar (TM)	
Date:	05/06/2020
Status:	Final
Dissemination level:	Public

2020 CiViTAS
Cleaner and better transport in cities
DESTINATIONS

THE CIVITAS INITIATIVE
IS CO-FINANCED BY THE
EUROPEAN UNION

Abstract

This document brings together the contributions of the various partners, in what were the experiences and results achieved in the scope of the demonstration projects developed in the CIVITAS DESTINATIONS Project, for the Work Package 5 – Smart & clean urban freight logistics at tourist destinations.

The partners of the six regions involved, designed, developed and created conditions to implement solutions to improve the efficiency and effectiveness of logistics operations in their cities, which have in common the particularity of being tourist destinations in island contexts.

The demonstration projects were developed within two clusters: **Cluster 1 – Solutions for efficient freight distribution** (Task 5.6), and **Cluster 2 – Collection of used cooking oils** (Task 5.7).

Project Partners

Organisation	Abbreviation	Country
Horários do Funchal, Transportes Públicos, SA	HF	PT
Agência Regional da Energia e Ambiente da Região Autónoma da Madeira	AREAM	PT
Câmara Municipal do Funchal	CMF	PT
Secretaria Regional da Economia Turismo e Cultura	SRETC	PT
Agência Regional para o Desenvolvimento da Investigação, Tecnologia e Inovação	ARDITI	PT
Limassol Tourism Development and Promotion Company Ltd	LTC	CY
Municipality of Limassol	LIMA	CY
Stratagem Energy Ltd	STRATA	CY
Dimos Rethimnis	RETH	EL
The Research Committee of the Technical University of Crete	TUC	EL
Comune Di Rio	Rio	IT
Comune Di Portoferraio	PF	IT
MemEx S.R.L.	MEMEX	IT
Authority for Transport in Malta	TM	MT
Valletta Kunsilli Lokali – Valletta Local Council	VLC	MT
Universita ta' Malta	UoM	MT
Ministry of Tourism	MOT	MT
Guaguas Municipales Sociedad Anonima	Guaguas	ES
CINESI S.L consultoria de transport	CINESI	ES
Ayutamiento de Las Palmas de Gran Canaria	LPGC	ES

Ingeniería Electrónica Canaria S.L	INELCAN	ES
Sociedad Municipal de Aparcamientos de Las Palmas de Gran Canaria	SAGULPA	ES
Istituto di Studi per l'Integrazione dei Sistemi	ISINNOVA	IT
European Integrated Project	EIP	RO
Sustainable Services	GV21	ES
Vectos GmbH	VECTOS-G	DE
Conférence des Régions Périphériques Maritimes d'Europe	CPMR	BE

Document History

Date	Person	Action	Status	Diss. Level
	Site leaders and measure leaders	Contributes to Part A	Draft	SC, WPL
13/04/2020	WP leaders	Compiled document 1st version	Draft 1	SC, ML, PC, TC
05/05/2020	Authors	Sending version for Peer Review 1	Draft 2	TUC
19/05/2020	TUC	Peer review 1	Draft 2	WPL
26/05/2020	Site leaders and measure leaders	Revision after Peer review 1	Draft 3	WPL
01/06/2020	Vectos	Peer review 2	Draft 3	WPL
05/06/2020	HF, A.Quintal	Validation by PC	Submitted	EC

Status: Draft, Final, Approved, and Submitted (to European Commission).

Dissemination Level: PC = Project Coordinator, SC=Site Coordinator, TC=Technical Coordinator, EM=Evaluation Manager, WPL=Work package leader, ML=Measure leader, EC=European Commission.

Table of Contents

List of Figures

Executive Summary

This document brings together the contributions of the various partners, outlining the experiences and results achieved in the scope of the demonstration projects developed in the CIVITAS DESTINATIONS Project, for Work Package 5 – Smart & clean urban freight logistics at tourist destinations.

Although fundamental for the cities' functioning, the dynamics associated with logistics operations can bring negative impacts to the economy and to the quality of life for residents and visitors, namely the costs related with the inefficient transport of goods and the impacts on urban landscape quality of disorganised loading and unloading operations. These impacts are particularly significant in cities geared towards tourism, which in turn increases the pressure on the logistics sector.

The partners of the six regions planned, designed, developed and created conditions to implement solutions to improve the efficiency and effectiveness of logistics operations in their cities, which have in common the particularity of being tourist destinations in island contexts.

The demonstration projects were developed within two clusters:

- **Cluster 1 – Solutions for efficient freight distribution** (Task 5.6), to which Funchal, Malta, Rethymno, Elba and Las Palmas contributed with solutions such as the creation of intelligent platforms for the management of loading and unloading places in consolidated urban areas; the creation of one shared goods transport service, with recourse to electric vehicles suitable for circulation in historic centres; the creation of a freight consolidation centre for more efficient redistribution; the creation of a mobile application for the management of freight transport operations, with optimisation of circuits; and the use of cleaner vehicles for a more efficient distribution and city waste collection.
- **Cluster 2 – Collection of used cooking oils** (Task 5.7), to which Rethymno and Limassol contributed with the development of schemes aimed at the promotion of UCO to biodiesel local chains, studying the exploitation of used cooking oils as alternative clean fuels, by developing more efficient collection processes for the producing sectors and analysing the technical and economic feasibility of producing biodiesel locally for consumption in transport.

Cities had different experiences and reached a diverse set of results, which is described in the following chapters. The main conclusions drawn for the success of the developed solutions can be summarised as following:

- a **preliminary feasibility study**, to identify the needs and analyse the technical and economic feasibility of the proposed solution before the implementation, contributes to decrease potential risk.
- develop solutions that **reduce operation and maintenance costs, optimise, and simplify existing procedures** are decisive to attract stakeholders' interest.

- use of **ICT support** to reduce operation costs, improve results, and increase the number of beneficiaries.
- design **business models** help the economic sustainability of the solutions.
- the alignment of the solutions with **strategic policy instruments**, adopted by the authorities and validated by the main stakeholders, consolidate the engagement of whole parts.
- the adoption of adequate **regulation** supports the implementation of the project and behaviour change.

1 Introduction

1.1 Overall DESTINATIONS Objectives

The CIVITAS DESTINATIONS project aimed to demonstrate and evaluate the effectiveness of innovative sustainable mobility solutions in six tourist cities with different characteristics but sharing common challenges. Cities must provide the high quality, sustainable environments desired by tourists, while providing local sustainable employment opportunities that overcome the seasonal and sometimes informal nature of tourist economies. Achieving sustainable mobility is a vital part of the growth equation for Europe's tourist cities. The project impacts will make a positive contribution to demonstrating how this can achieve growth and therefore provide a benchmark for other EU tourist cities.

The solutions are addressed to:

- Sustainable Urban Mobility Planning for residents and visitors
- Safe, attractive, and accessible public spaces for all generations
- Shared mobility and e-infrastructures towards zero emissions transport
- Smart & clean urban freight logistics at tourist destinations
- Mobility management & awareness for sustainable mobility
- Attractive, clean, accessible, and efficient public transport

1.2 WP5 Objectives

WP5, focusing on the logistics sector, aims to design, implement, and demonstrate targeted measures for:

- improving and optimising freight services that exploit the existing resources and relieve the constraints imposed to tourist destinations.
- adapting the logistic offer to the total mobility demand in low emissions zones and in historic areas, supporting smart consolidation platforms.
- encouraging the use of clean vehicles for last mile delivery in order to reduce the environmental impacts of the logistics services.
- promoting the use of clean fuels through the creation of biofuels value chains and public awareness activities.

WP5 also guarantees the common objectives of the horizontal activities, such as stakeholder engagement, results evaluation, cross-site knowledge transfer, business modelling and replicability potential.

1.3 Task 5.5 – Site preparation, solution deployment supporting actions and demo setup for freight logistics pilots

Based on solutions for smart and clean urban freight logistics services designed in Task 5.4 (Design of services and supporting technologies design for freight logistics pilots), each one of the six CIVITAS DESTINATIONS sites launched and implemented new logistics services, which included ITC supporting systems, more efficient operational procedures, competent partnerships, adequate regulation, and more clean and efficient transport technologies, in the scope of the two predefined clusters: solutions for efficient freight distribution (Task 5.6) and demonstration of UCO to biodiesel local chains (Task 5.7). Monitoring proceedings were implemented in each site to evaluate the performance and the impact of each pilot project.

1.4 Deliverable 5.3 Objectives

Deliverable D5.3 “Implementation and demonstration report on smart and clean urban freight measures” reports the results of the demonstration projects implemented under the freight logistics solutions and the used cooking oil collection by the six participant sites, and draws valuable conclusions and learnings that can transferred to the audience.

2 Solutions for efficient freight distribution (Task 5.6)

2.1 MAD 5.1 – Urban Freight solutions

Prior to the DESTINATIONS project, the Municipality did not had the chance to properly assess the freight logistics operations in Funchal. Therefore, the SULP provided not only a detailed insightful assessment of the goods distribution in Funchal, highlighting all the issues, but also an integrated strategic vision over a long-term period to overcome several barriers through a set of innovative actions. The subsections below describe in detail the various cornerstones of this measure.

Setting up a sustainable urban logistics plan in Funchal

Based on the enclosed guidelines, the development of the SULP followed several stages. The first stage, territorial diagnostic was undertaken between February and November of 2018 and was dedicated primarily to data collection to assess the freight logistic operations in Funchal. This included traffic counts, monitoring of load and unload dedicated parking spots and two surveys geared towards drivers and local traders.

The territorial diagnostic undertaken led to the strategic definition of measures, carried out between December 2018 and April 2019, related to regulation tools, awareness campaigns, reorganisation of parking spots related to load and unload operations, creation of freight terminals, purchase of electric vehicles, and real time monitoring systems, among other actions. In addition, business models were outlined by April 2019 to further engage stakeholders and freight agents. Some of the actions are expected to be developed on a long-term period, beyond DESTINATIONS lifespan, and were already inscribed in the forthcoming framework programme to unlock funding.

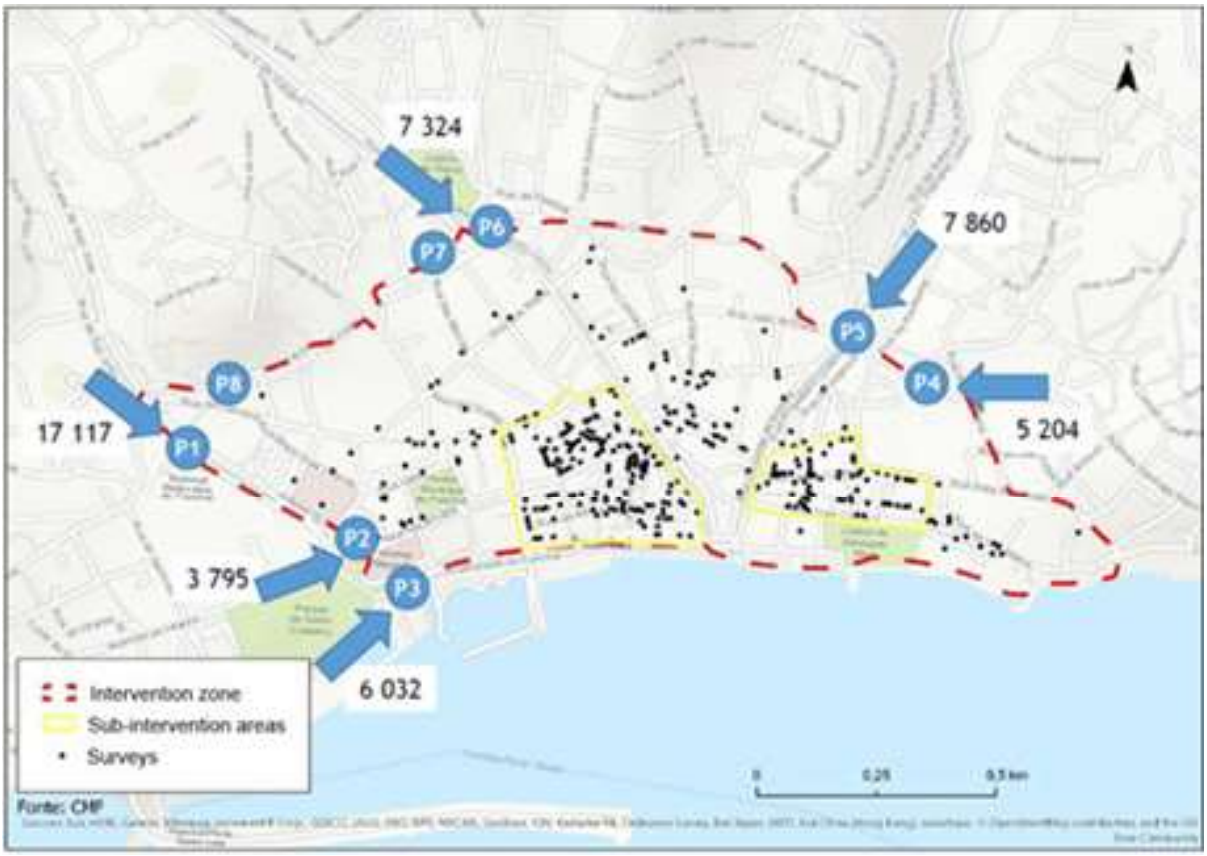

Figure 1: Freight activity in Funchal, one of the key indicators gathered during the territorial diagnostic stage

Another stage concerned the establishment of guidelines for establishing freight regulation in Funchal. The regulation criteria were outlined to define the traffic and stopping rules for carrying out loading and unloading operations. In addition, the respective schedules and the supervision regime was also defined. Ten criteria were defined ranging from zoning of the territory, inspection, opening hours, maximum stopping times, tariffs, access to conditional access zones and type of vehicle allowed to access the areas. In order to monitor the impact of the actions undertaken within the SUMP of Funchal, a monitoring plan was also developed by April 2019 to assess the impacts of the actions and other awareness activities geared towards several target groups. 17 indicators were defined, enhancing the DESTINATIONS evaluation process.

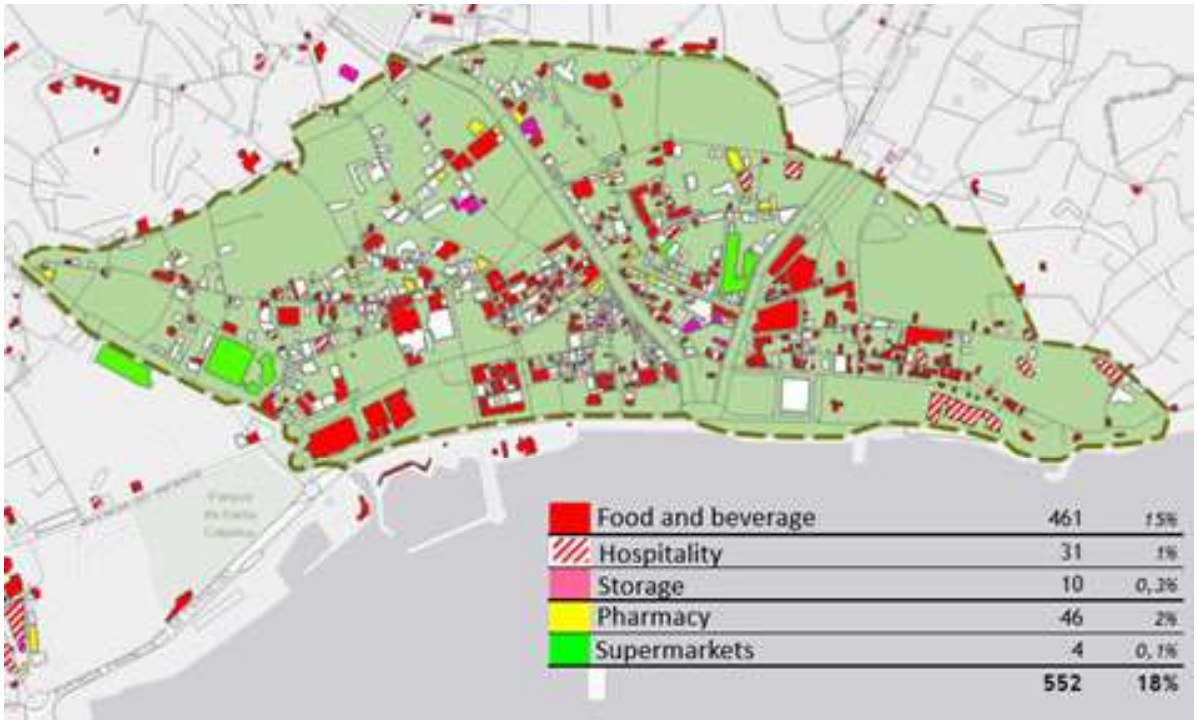

Figure 2: Profiling of local traders in the target area

Pilot area to monitor loading and unloading services

Two main sub-areas in Funchal, marked by heavy logistics activity, were identified as being the intervention areas in which the activities were tested. Within these two sub areas, 17 parking spots dedicated for load and unload operations were identified and some of them will be used for the pilot project. This action experienced some delays due to the technological complexity and given that, according to other sites that were reached out by the Municipality, the solutions deployed suffered from technical issues. According to the contacts established with cities in October 2019, as well as meetings with companies, the technology is still in a very early stage with several connectivity issues.

In addition, the lack of an enforcement team in Funchal aggravated the risk of implementing an ITS measure to monitor freight logistics in the city at this stage.

Nevertheless, and considering the importance of ITS to improve mobility, the Municipality of Funchal is actively seeking a straightforward solution that meets user needs while allowing for data collection regarding the occupancy of parking spots dedicated for load and unload operations. This solution implies, at this stage, the deployment of sensors on the loading bays that can provide the municipality with a vast array of data to support the decision-making process. Follow up meetings were undertaken by May 2020.

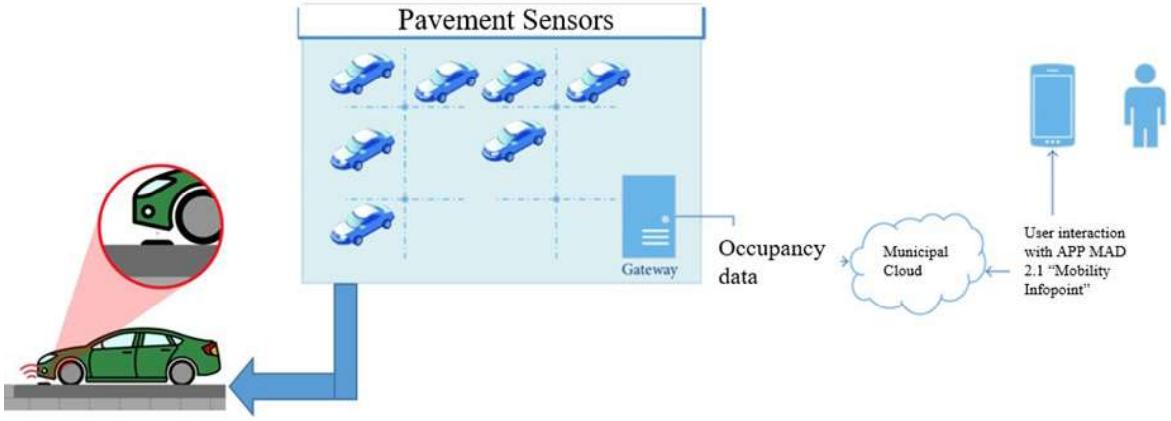

Figure 3: Diagram of the communication protocol between the ITS solution sought in Funchal and the APP launched within MAD 2.1

For freight agents, a communication protocol is expected to be developed between the sensors and an already available APP so that users can track down the loading bays that are available in Funchal, minimising the risk of parking on sideways and road as well as reducing time searching for a parking bay. After this stage and the availability of a municipal enforcement team, the Municipality of Funchal will assess the feasibility to pursue a second stage in order to further manage freight logistics.

Creation of urban logistics group with stakeholders

During the diagnostic stage of the SULP, an urban logistics group was established in which meetings took place in February 2018 to further understand the specific needs of freight logistics in Funchal. The group includes the main freight agents operating in the Municipality. In addition, a kick-off session was launched to present the goals within the SULP and its several development stages. More meetings are intended to be promoted accordingly to the actions outlined within the SUMP.

Figure 4: Awareness raising actions and individual meetings with stakeholders

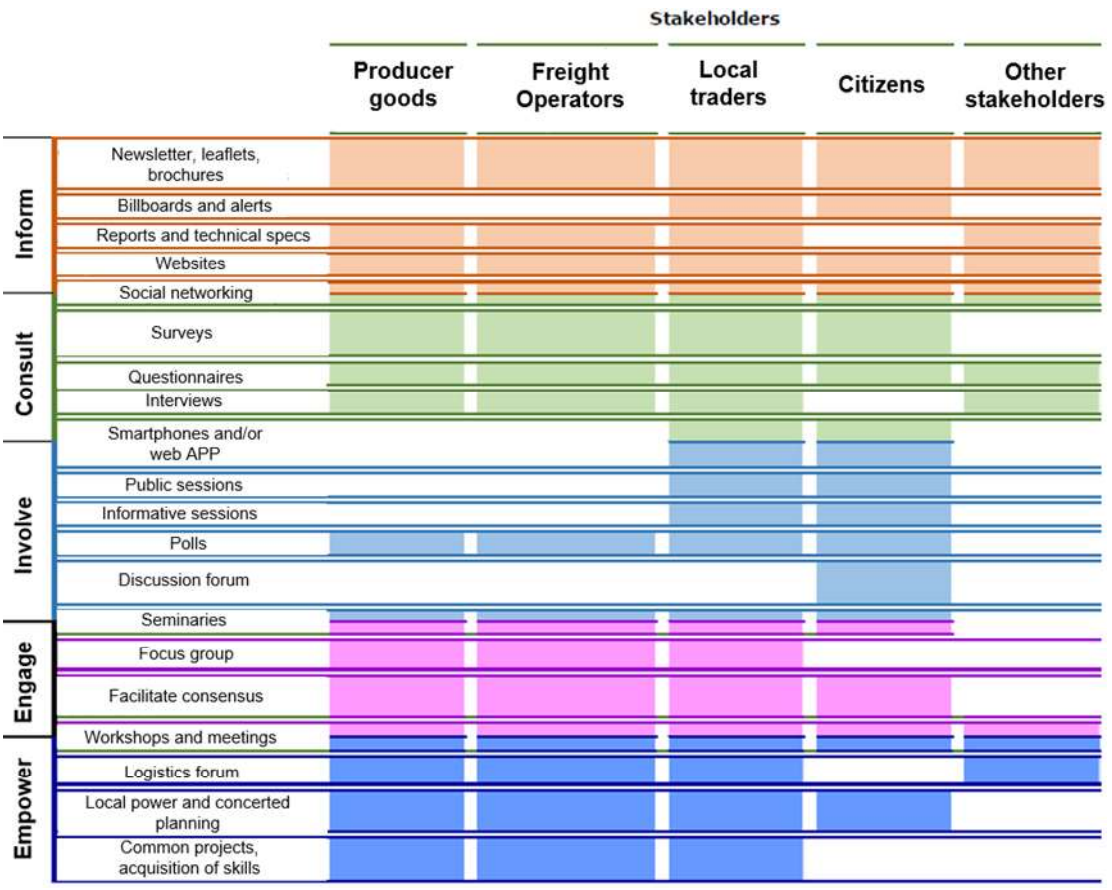

Figure 5: Communication strategy to engage stakeholders in the freight participatory process

Adapt public transport to be able to transport goods

Horários do Funchal studied several options to offer a space where passengers could transport their goods inside the bus, to promote the use of public transport as an efficient mode of transport for shopping. Following the analysis, Horários do Funchal found the best solution. In January 2020, a solution was installed in 24 buses that allowed luggage to be transported on board, increasing comfort and safety inside the bus.

Figure 6: Equipment to transport luggage on board

2.2 MAL 5.1 – Last Mile Delivery of Goods

The Valletta Region commonly experiences traffic and congestion problems as a direct result of inefficient operations in goods delivery, illegal parking practices and the use of unsuitably large and high-polluting vehicles. These problems lead to high emissions and time loss, which negatively impacts the urban fabric and public health.

As part of the DESTINATIONS project, a pilot project for the last mile delivery of goods has been designed. Through a fruitful collaboration between TM, UoM and the Malta Chamber of SMEs (GRTU, the General Retailers and Traders Union), the Ta' Qali Crafts Village was identified as a suitable group of operators to participate in this pilot. Ta' Qali Crafts Village is a group of shops selling local crafts and artisanal products, who supply a number of souvenir shops in Valletta. Through the pilot project, the operators are testing the use of a shared electric van to deliver their goods from their location in the centre of the island, to Valletta. The service of the shared electric van between different operators to perform their deliveries to the capital Valletta and the wider Valletta Region is the first application of a shared delivery concept on the islands.

The electric van, a Renault Master, which was acquired in December 2019, is currently being used for the consolidated transport of goods manufactured by a number of crafts shops in Ta' Qali to souvenir shops in Valletta. The Crafts Village Members Association coordinate the use of the electric van and the delivery of goods through direct contacts via phone calls. As of February 2020, 7 businesses are taking part in this pilot project and, though there is no regular route schedule yet, the interest of other Ta' Qali Crafts Village businesses to join the shared service is progressively increasing.

Throughout the pilot project, there will be zero costs associated with the van use, parking, and electricity usage for participating businesses. Prior to this project, goods to Valletta were

delivered by the individual business owners' personal ICE vehicles. This new system of consolidated transport by electric van succeeded in decreasing both the number of trips and the level of emissions. Currently, the electric van is used every day, saving 3-5 litres of diesel fuel per day, corresponding to 20-50 km distance which used to be covered daily, per business. Data and logs collected up to date indicate that on average, the electric van is replacing a 3.5t diesel van thus saving about 3t CO_2 per year, with NOx and PM reduced by 60 to 80%.

The assistance provided by the key stakeholders (GRTU, the General Retailers and Traders Union) enabled the identification of suitable partners for the pilot and contributed to the active participation of the operators in the implementation of the pilot. Furthermore, the pilot is not only optimising operations of logistics for a group of operators, but has the added value of doing so with a group of companies that focus on a specific tourist product (locally made souvenirs), fully fitting within the scope of the project: the promotion of sustainable mobility measures at tourist destinations.

Figure 7: The electric van used for goods delivery in the pilot project

2.3 RET 5.1 – Sustainable freight logistics plan

Measure overview and results

With the vision to improve the operation of freight distribution in the wider area of Rethymno Municipality, the first Sustainable Urban Logistics Plan (SULP) was conducted. The SULP aims to optimise the supply of goods to the historic city centre and to reduce the number of logistics fleets circulating in the city centre, thus decreasing traffic congestion, noise, and air pollution resulting from freight distribution. The measure, developed in close consultation with an urban logistics advisory group and the active involvement of key stakeholders, delivered:

- Analysis of the current transport situation and problems faced by businesses for their delivery operations, to provide evidence of existing situations to all stakeholders. Some areas were identified as priorities for action, e.g. the historical centre and pedestrian area, main streets in the commercial centre and the main street along the beach.
- An urban logistics advisory group in operation, actively involving logistics companies and key stakeholders to the SULP development process. One-to-one meetings were held with representatives from both the supply and demand sides, freight logistic companies and hoteliers/retailers, in addition to consultation meetings to exchange on possible solutions/measures to be included in the SULP.
- The 1st SULP for the city. The SULP suggests focussing on the improvement and re-design of loading bays, testing applications for better use the loading bays and more coordinated access to the historic city centre.
- Consultation meetings to define and agree on the pilot project to be developed in the old town of Rethymno. Consensus achieved amongst stakeholders (Municipality, Local Businessmen, Freight Logistics Companies, SULP Contractor).
- A management platform for load and unload operations launched as a pilot demonstration project.

The innovative element of this measure is the coordination of the freight distribution processes, among the different actors, with an online ITS system. The online platform will manage the schedule of freight delivery according to the demand and supply of goods in the targeted area (historic city centre). The approach tested could be expanded to more areas with high demand for goods delivery.

The measure achieved the exceptional cooperation among the Municipality and the freight distribution companies and the analysis of the day-to-day difficulties being faced. In parallel, data for a set of key performance indicators for urban deliveries were collected via field surveys. One of the main findings is that the area is not suffering from traffic due to insufficient infrastructure on the street but is more related to the lack of loading bays and limited parking availability. Therefore, the most widely accepted solution was the re-design of loading bays in the city and improved access rules based on IT solutions and online booking of loading bays. Overall, the increased awareness among the freight distribution companies helps to reduce illegal driving behaviour related to the parking regulations and, in general, wider compliance to the access regulations in the historic centre, thus leading to more organised freight distribution with reduced trips and hence reductions in congestion and city pollution.

Learning points and reflections from the implementation

The active involvement of key stakeholders both from the supply and demand sides (freight distribution companies, retailers, hoteliers and bar/restaurant owners) through targeted interviews and one-to-one meetings helped to better define the users' needs and to identify the most suitable solutions. A difficulty was faced initially, as the freight distribution companies were receiving pressure from the retailers, hoteliers, and bar/restaurant owners to deliver

goods during restricted hours within the historic centre. In response to this, it was decided to strengthen the measures in the historic centre and to further monitor the access points with heavy fines for the trespassers.

The involved stakeholders have actively participated in one-to-one meetings and the SULP consultation events and remain committed to contribute and comply with the new regulation, and to support the pilot providing feedback during its implementation.

Rethymno Municipality attracts a great number of tourists all through the year, which are accommodated in the city hotels and in large facilities of big hotel chains in the wider area. The SULP measures, along with the pilot operation of the management platform for load and unload operations, will tackle the anarchic deliveries in the city centre. In the long run, the results from its implementation will enhance the touristic experience and safety in the historic centre and will help to promote Rethymno as a sustainable destination.

Stakeholder engagement

The freight logistic companies and hotel suppliers have been identified as the key stakeholders for the measure. The Hoteliers associations, retailers, shop, and restaurant owners showed an increased interest during the measure implementation and have been highly supportive. Moreover, the local unit of the Technical Chamber of Greece, the Union of the Old Town Residents, the Chamber of Commerce and Industry of Rethymno, and the municipal Urban Planners, have been actively engaged in the consultation process, providing expertise and support during the development of the action plan and the new framework of regulations regarding the freight system.

Figure 8: Consultation meetings of Rethymno Municipality with local stakeholders

Figure 9: Circulation restriction in the historic city centre – Sign at the entrance of the SULP targeted area

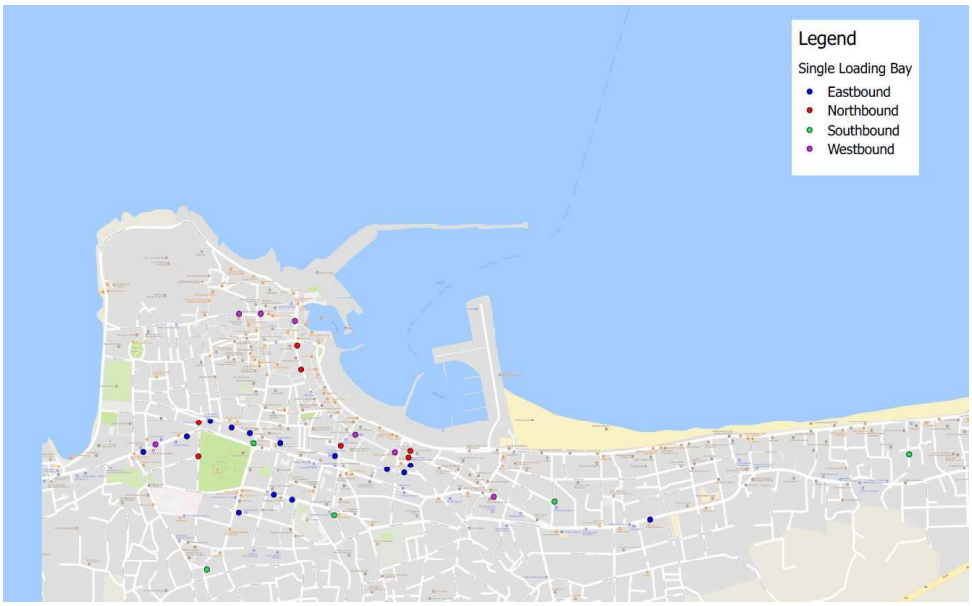

Figure 10: Loading bays map

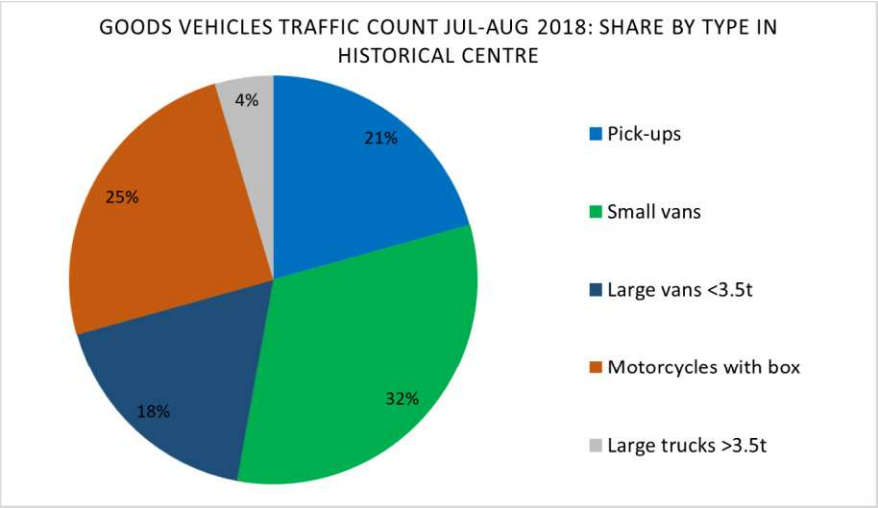

Figure 11: Types of goods delivery vehicles

Cumulative effect from the combination of CIVITAS measures

RET 5.1, which aims to tackle freight distribution congestion and pollution in the historic centre of Rethymno, is directly linked to the SUMP development (RET 2.1); both strategic plans work consistently with the city's vision and priority measures. Also, the development of a Low Emissions Zone Study as part of the measure RET 6.2 is related to the SULP and the development of the IT solution.

Funding unlocked due to the measure

The municipality of Rethymno introduced more cameras to cover all entrances in the historic centre, aiming to monitor and to further restrict trespassers, with municipal budget.

2.4 ELB 5.1 – Island freight logistics for tourist services

Measure description

In the summer, Elba island has a strong tourist presence with high traffic flows (private and commercial), with a direct impact on the environment in a narrow sense (atmospheric pollution) but also on aspects such as acoustics, landscape, indiscriminate use/consumption of areas for wild parking lots. All these aspects are aggravated by the morphology of the island, which involves a narrow road network, often winding and with steep gradients, unsuitable for sustaining high traffic flows. To all this is added the need to meet the consequent needs for the supply of consumer goods with the strong tourist presence, which entails a considerable flow of commercial vehicles. This flow of goods, not having a large origin in the island, uses the Piombino-Elba Island ferry connection with consequent inefficiencies (low load percentages, downtime, etc.) and an increase in transport costs.

The purpose of the ELB5.1 measure is to demonstrate a new way of distributing goods (especially in food and drink) to tourist service facilities, i.e. HoReCa, by reducing the number of commercial vehicles circulating for the distribution of goods. In fact, it is more rational to use a consolidation centre in Piombino for goods transported by small commercial vehicles, avoiding their arrival on the island, subsequently these goods will be transported to a hub on the island by means of a large commercial vehicle and finally distributed to HoReCa in an optimised way and with low environmental impact vehicles.

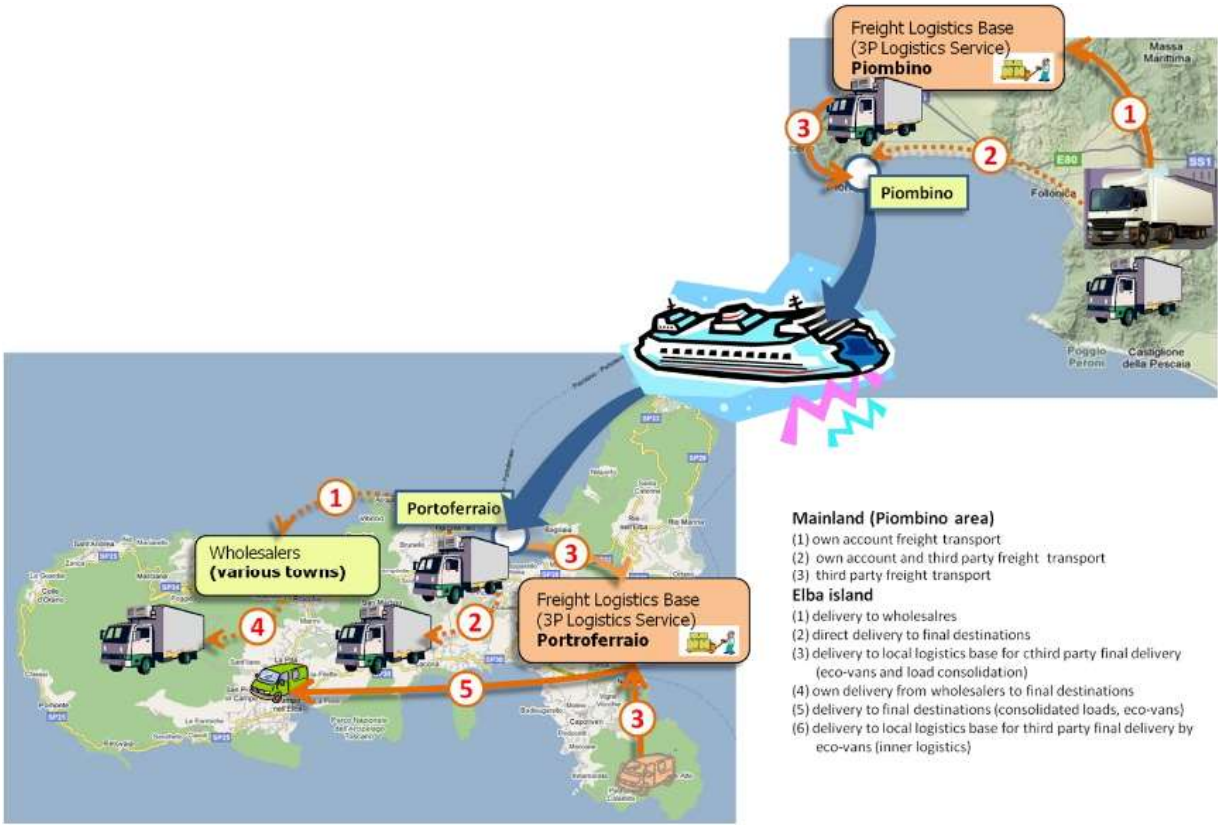

Figure 12: Elba Island's freight supply scheme with consolidation centres

Measure results

The municipality of Portoferraio in 2019, through a tender, selected a freight transporter in HoReCa for the data survey that used both a consolidation centre in Piombino and a distribution base in Portoferraio.

The demand for goods supply on the island takes place mainly during the months of May, June, and July. During this period, 1.535 deliveries were made to the HoReCa (over 25% of the total deliveries) using a vehicle dedicated to this activity, resulting in a significant reduction of the daily circulation of small commercial vehicles on the island.

Figure 13: Large trucks unload (in the hub of Elba) goods coming from the Piombino consolidation centre for distribution to HoReCa with small trucks

Reflections

Preliminary studies (carried out by Rio and Portoferraio Municipalities) have defined a reference framework that identifies the tourist freight transport demand dimension to plan appropriate service models for the management of goods distribution in Elba Island. This reference framework considers 550 Ho.Re.Ca. businesses (230 hotels, 320 restaurant and catering) as potential final destinations of the distribution through consolidation centres.

Almost all these businesses have expressed a positive opinion regarding this method of supplying goods. Some difficulties were identified with some of the transporters with small vehicles who often preferred to go directly to the island, despite the longer travel time and the cost of the ferry, to better maintain direct contact with their customers.

However, the number of deliveries made and the consequent decrease in circulating commercial vehicles reflects the success of the measure and shows that this method of distribution of goods is to be established and further increased also by expanding to all the other goods distributions on the island.

2.5 LPA 5.1 – D4 Service: The Smart Distribution System

Measure overview and results

The Sustainable Urban Logistics Plan (SULP) of Las Palmas de Gran Canaria (measure LPA 5.2) identified the strengths and weaknesses of urban freight in the city. Amongst the weaknesses, the SULP spotted the following: poor degree of digitisation of the local freight companies and a lack of information about last mile deliveries.

The D4Service (https://www.d4service.com/Home/QueEsD4Service.aspx) is an initial step to overcome this problem by providing a smart distribution system to small local businesses in order to make urban delivery processes more efficient. This app that organises delivery routes automatically and allows real-time communication with customers has been developed within CIVITAS DESTINATIONS by Inelcan.

The main characteristics of the D4Service are summarised below:

- The drivers access the app with their login information to see the routes schedule programmed by the company.
- Once they arrive at each destination, the D4Service automatically informs the company about the completion of the assigned route.
- It shows all the deliveries to be carried out and indicates the start of the workday. In that moment, clients receive an SMS with the estimated delivery time.
- D4Service also allows the company to inform the receiver about a possible delay or unexpected incidents.

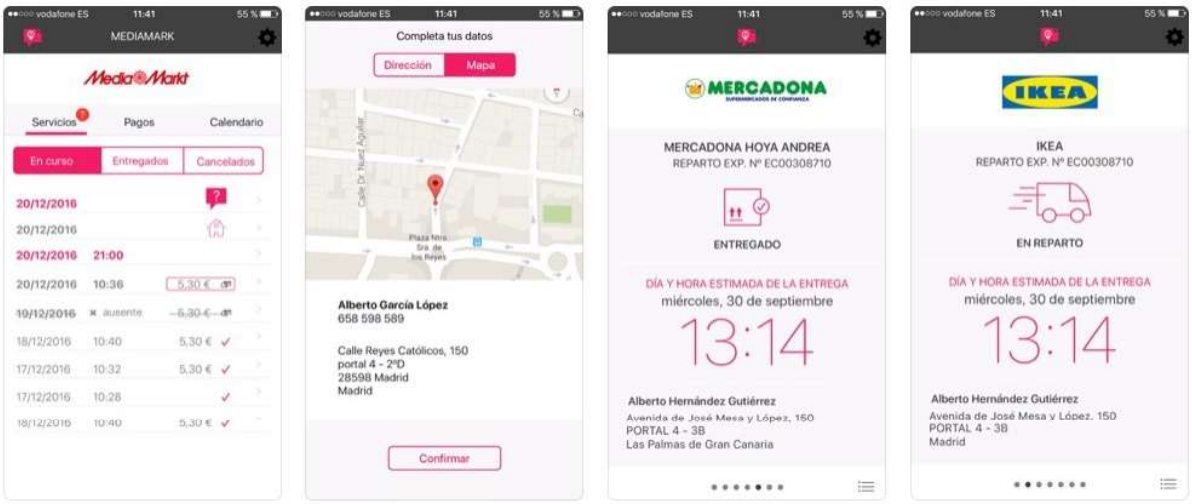

Figure 14: The mobile app D4Service (source: Inelcan)

The most innovative issue regarding this measure has been the collaboration between a private start-up (Inelcan) and the research environment of Gran Canaria (*Universidad de Las Palmas de Gran Canaria*), in order to design and develop a solution for urban freight.

Amongst others, the main advantage of the D4Service for local freight companies is that it allows them to organise the distribution process beforehand and react in real time to changes that might occur during the day.

Moreover, it does not need new infrastructure and optimises all the existing resources, making the managing and delivering costs lower. The business model is to provide pay-per-use service without spending on infrastructure.

D4 Service offers the possibility to make the delivery process more efficient for the distribution company and “liberates” the receiving party since they will be informed beforehand about the real delivery time.

On the one hand, the main result of this new service is a higher level of customer satisfaction since it helps them to save time. On the other hand, the App is helping logistic companies to optimise their routes in the following way:

- Vehicles can cover more routes/deliveries in one shift (+8.6% with an average of 9.5 deliveries /vehicle)

- Reduction of fuel consumed (4,7% fuel saved)
- Reduction of polluting emissions
- Reduction of operating costs (fuel, etc.)

Nowadays, over 50 companies and 1,732 commercial vehicles in Spain (both in the Canary Islands and the mainland) and Perú (South America) are using the D4Service. Freight companies pay a monthly fee for using the software license which depends on the number of vehicles.

Learning points and reflections

The main learning point of this measure is that all solutions to urban freight problems should be aligned with the overall urban freight strategy of the city (the SULP). Besides this, it was realised that it is important to engage with local stakeholders to identify which are their needs and requirements.

If able to repeat the measure, it would be interesting to try to involve public stakeholders in the very early design stages. That would have helped to include some features in the App aligned with the overall sustainable freight strategy of the city.

After a pilot that lasted between 2017 and 2018, the D4Service has been improved and modified according to the stakeholders' and the Municipality's requirements. Since summer 2019, the service is fully operational but can only be used in Spain. Despite that, it could easily be replicated to other European touristic sites.

2.6 LPA 5.2 – Urban Freight Solutions into SUMP

Measure results and outputs

The main output of the SULP's action plan is an efficient package of measures to ensure safe, reliable, and efficient freight distribution in Las Palmas de Gran Canaria. Despite the fact that the SULP has not yet been officially approved by the Municipality (to be approved as soon as the overall update of the SUMP is completed), the Municipality and some key local stakeholders have started to work on some strategic issues regarding urban freight.

The main results of the operation stage of LPA5.2 are summarised below:

- **Shift to clean fleet in waste management –** (11 new Euro 6 vehicles) because a minimum % of energy efficient vehicles was included in tender procedures. These new vehicles have replaced the oldest vehicles of the waste management fleet (that were purchased between 1987 and 1992). The overall investment for purchasing these new vehicles has been 1,13 M€.


Figure 15: The new Euro 6 vehicles of the waste management fleet (Source: Municipality of Las Palmas de Gran Canaria)

- **Energy efficient vehicles in public companies' fleets –** Thanks to CIVITAS DESTINATIONS funding, Sagulpa's stewards carry on the enforcement of the loading/unloading bays using electric vans (measure LPA4.2). The use of these energy-efficient vehicles has led to a **reduction of fuel consumption –** the conventional vans that were replaced by the 3 e-vans consumed 18.222 litres of diesel between 2014 and 2016 (an average of 6.000 litres of diesel per year), Sagulpa is currently saving around 600 Euros/month on fuel – a **reduction of CO_2 emissions** (kg) by 50% and a **reduction of maintenance costs** of around 2.500 Euros/year (reduction of 71%).
- **Installation of 192 sensors for real-time data collection on the filling level (%) of the plastic and paper bins –** This data is helping to optimise the waste management, saving time, money and reducing CO_2 emissions. Every hour the system generates new information on the filling level of the container based on the latest measurements produced by the sensor. The algorithm used to generate the information prevents false filling and emptying alarms which could be produced due to the non-uniform distribution of waste inside the container. Based on real-time information it is possible to determine when the container has been filled or emptied and with the historical information make predictions and optimise collection routes.
- **A pilot about real-time information of the loading/unloading bays using on-street sensors –** Las Palmas de Gran Canaria received over 5,90M€ from a Spanish ERDF funding programme (RED.ES) to fund some smart city initiatives (https://www.laspalmasgc.es/es/areas-tematicas/innovacion/lpa-inteligencia-azul). Amongst other actions, Sagulpa is currently installing 3,000 on-street sensors in its on-street parking management areas (short-term parking areas, residents' areas, loading/unloading bays, etc.). The data gathered from these parking sensors will be included into Sagulpa's business intelligence tool.
- **A route planning software for small business (the D4Service) –** This action was explained in the description of LPA5.1 measure.

The governance model of the SULP is the most innovative element regarding this measure because it is the first time that the public and private-sector parties involved in freight transport and logistics work together to prioritise, implement and assess solutions, with the intention of

improving the sustainability of freight transport activities in an economic, social and environmental sense.

Up to now this Freight Quality Partnership (FQP) is integrated into the regular meetings with the key local stakeholders that organises and manages the Mobility Office (LPA2.1).

On the one hand, the main difficulty to coordinate these measures and/or pilots regarding urban freight was that no one within the Municipality was in charge of the freight distribution in the city. This lack of a governance model for urban freight made it difficult to find synergies, share experiences and knowledge learnt, and identify common interests. On the other hand, the smart city strategy of the Municipality (called *LPA Inteligencia Azul* in Spanish and co-funded by ERDF funds) contributed to the success of these measures and pilots because it brought a strong political support (allocation of budget, political priorities, etc.).

With the opportunity to replicate LPA5.2, it would be mandatory to try to define and agree a governance model for urban freight in Las Palmas de Gran Canaria with all key local stakeholders before implementing these measures and pilots.

The tourist nature of Las Palmas de Gran Canaria (and of all island of Gran Canaria) is slightly different from other CIVITAS DESTINATIONS sites because there are no seasonal peaks regarding tourism. In fact, tourist flows maintain a regular trend throughout the year: in winter most of the visitors come from Central and North European countries, and in summer tourists come mainly from other Spanish regions. This helps to design and implement measures that are valid all-year-long and to assess urban freight.

Residents and tourist involvement

The measures and pilots included in the Action Plan of the SULP are addressed to urban freight stakeholders across the supply chain (including shippers, carriers, logistics providers, and customers and businesses, as well as key affiliates such as trade associations). Therefore, residents and tourists are not directly involved in their implementation.

Stakeholder engagement

Thanks to the implementation of some measures and pilots included in the SULP, both the Municipality and Sagulpa have strengthened the cooperation with some key stakeholders such as the local freight association (FET-Federación de Empresarios de Transporte) and some local freight companies.

2.7 Cluster analysis

The dynamics of the logistics sector, necessary for the efficient functioning of cities and economy, implies big amounts of displacements in the city, the circulation of large vehicles, loading and unloading operations, and the management of places dedicated to these operations, and management of last mile delivery. When all these operations are not properly planned and executed, this can seriously affect the cities, their economy, and the quality of life of residents and visitors.

Special attention should be paid, when dealing with city tourist destinations, to the quality of life and experiences that are being offered to visitors. Tourism itself generates a large amount of displacements for the transport of goods, raising pressure on the logistics system and affecting quality of life of residents and visitors.

Another problem for several small islands is the seasonality of tourism – the number of visitors can increase several times in a short period of time and can sometimes lead to the disruption of transport systems for people and goods. This seasonality of tourism can be a barrier to the economic feasibility of some logistics solutions.

The major concern of CIVITAS DESTINATIONS partners in this cluster was to create solutions for freight distribution local needs, combining with ICT and clean energy alternatives, aiming to improve the efficiency of the services and to reduce its impacts in the tourist destinations, from which several lessons were learned.

Building an image of an environmentally sustainable company is an important driver that weighs in the moment of engaging stakeholders in the projects. But there are more factors that can be considered as decisive, such as the immediate or short-term reduction of operation and maintenance costs, and the simplification of operations. This was the case of Las Palmas projects, with the D4Service app, and of Elba, with the goods consolidation centre, projects that resulted in simplified last mile delivery operations and in reduced costs. These two projects were developed in a user-pays' business model base.

Another important aspect of the success of the pilot projects is that they should be coherent with the cities development of public policies and be supported by adequate regulation, to engage stakeholders and citizens for new practices and behaviours. For example, the projects from Las Palmas, Funchal and Rethymno, with the development of an online platform for managing load and unload parking places; from Elba with the consolidation centre; and from Malta with the shared goods distribution service. All these projects need adequate regulation to support their implementation and scale up.

Another conclusion is that the solutions supported by ICT offer several benefits, such as a reduced need for human resources, faster processing of information and a greater number of beneficiaries. It is the example of the management tools for loading and unloading parking lots, which requires less staffing to inspect the use of the places, and the management of the information emitted by the smart sensors that allows support to facilitate the operation of users and the work of municipalities.

The replication of some measures in other cities may be limited to the territorial and economic contexts in which these tourist destinations are inserted. Some measures work well because they are contextualised in cities in which tourist activity remains active throughout the year, without feeling the effects of seasonality, or because they are contextualised in islands that, although isolated, are close to the mainland.

It is the case of the creation of the freight consolidation centre solution in Elba, that is experimenting positive results and is working well because of the short distance between the island and the mainland; or the case of D4service launched in Las Palmas, that is attracting a significant number of investors because the demand is stable throughout the year.

In summary, the main recommendations that emanate from the experience of the partners, the implementation processes and the results obtained, are as follows:

- **Framework of projects in Sustainable Urban Logistics Plans –** The alignment of projects with strategic guiding instruments, adopted by the authorities and validated by the main stakeholders, is fundamental for the success of the results, both for an integrated articulation with other projects, and for greater involvement stakeholders at various levels.
- **Preparation of adequate regulation –** The creation of local or regional regulation to support the implementation of some projects, is considered essential to the success, especially for projects that do not reflect an immediate economic benefit for companies and citizens.
- **Preliminary study –** Carrying out a preliminary feasibility study before the implementation of the proposed solutions, contributes to reduce the risk, to identify the needs and analyse the technical and economic feasibility.
- **Stakeholder engagement –** The involvement of key stakeholders, public and private, in the launch of demonstration projects is important to obtain successful results and achieving the desired replicating effect. Therefore, to develop solutions that reduce operation and maintenance costs and simplify proceedings are decisive to attract stakeholders from the business sector.
- **Design of business models –** The design of business models is important to plan and support the sustainability of the solutions in the long term.
- **Enhance of transferability potential –** A comprehensive presentation to highlight the impact in economy, environment and society of results achieved, including the main implementation steps and success factors, will serve as a useful tool for successful replication to other tourism destinations.

3 Collection of used cooking oils (Task 5.7)

3.1 RET 5.2 – Cooperative mobility – UCO to biodiesel chain-demonstration

Measure overview and results

An operational scheme for a full UCO-to-biodiesel chain and new "smart" systems, to optimise the UCO collection and transformation to a clean fuel, was defined by the Renewable and Sustainable Energy Systems Lab of the Technical University of Crete, in collaboration with the Municipality of Rethymno and local stakeholders. The measure delivered:

- A new "smart" Used Cooking Oil (UCO) collection system
- 30 new collection points installed, with dedicated signage to promote recycling and proper disposal
- A small-scale biodiesel production unit, testing the UCO transformation to clean fuel, for demonstration purposes
- Increased rate of UCO recycling and minimization of its improper disposal
- A feasibility study for a new business model implementing the full UCO-to-biodiesel chain with the aim to turn this hazardous waste into energy (locally produced clean fuel)

The new innovative UCO collection system integrates smart sensors at the UCO collection containers. The sensors are connected, via GSM technology, to a web-based platform which allows real-time monitoring of oil filling level and the bins' location. Based on data collected, the platform allows optimisation of the collector's drivers' routes and sends alerts to the administrators in case of leaks, temperature rise, unauthorised incidents (theft, vandalism, reallocation of bins) and low battery level.

The measure promotes both recycling and alternative clean fuels benefits through targeted promotional activities for households and schools' community.

A cooperative business model for a local biodiesel production unit from locally collected UCO (to feed the municipal fleet) has been studied, as a measure to benefit both the local economy and environment.

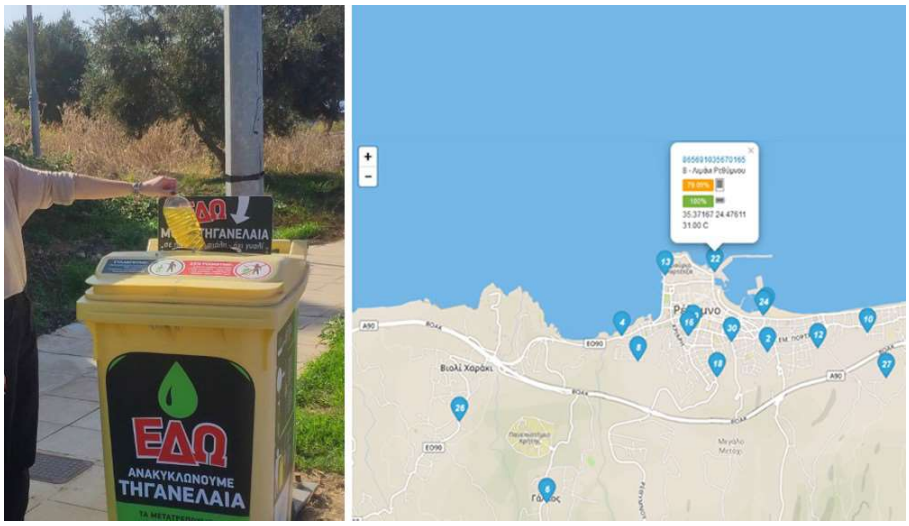

Figure 16: "Smart" UCO collection bins with dedicated signage (left), and bins locations monitored real-time through the web platform (right)

Learning points and reflections from the implementation

Recycling Used Cooking Oil (UCO) to biodiesel can be a sustainable alternative for the exploitation of a problematic waste product, allowing its transformation into an energy resource and contributing to the reduction of environmental hazards and fossil fuel dependence, while it presents “ethical advantage” in the contrary to other biofuel feedstock, which are produced by cultivated crops and may affect the food supply.

The new smart management system increases the efficiency of waste management and reduces operational costs. Fewer collection trips result to less fuel consumption and therefore to reduced greenhouse gas emissions.

The full chain for the transformation of UCO has been tested at a research level. Due to regulatory limitations, the biodiesel production from UCO is currently permitted only for research, hindering its use in the municipal fleet as initially planned.

The developed approach can be replicated by other EU municipalities. Also, the smart UCO collection scheme can be extended to other types of waste, therefore enhancing the overall recycling concept offering further environmental and financial benefits to local communities.

Residents and tourist involvement

Targeted promotional activities have been initiated to raise awareness towards clean fuels and biodiesel advantages and to motivate behavioural changes towards an increased UCO recycling rate as an opportunity to turn a waste into an energy resource. School campaigns and open-air laboratories were organised to inform households about the environmental and financial benefits of UCO transformation to biodiesel and about the new UCO collection point locations. Promotional materials include location maps/postcards, biodiesel production cycle posters, social media posts, press items.

School communities were involved in training sessions about the biofuels and the biodiesel production cycle and have been very active towards UCO recycling.

Stakeholder engagement

A local stakeholder's working team has been initiated by the Renewable and Sustainable Energy Systems Lab of the Technical University of Crete to discuss the different aspects of the measure including technical, operational, and legislative issues. The local team consisted of the Municipality of Rethymno, the Waste Management and Urban Environment Department, the Planning and Development Services Directorate, the Municipal Enterprise of Water and Sewage, the Inter-Municipal Waste Management Company; School Communities (schools involved in UCO recycling campaigns), the Department of Education & Lifelong, licensed UCO collectors based in the region and the HORECA related Associations.

As soon as the measure design was defined and set in operation, the Municipal Waste Management and Environment Department was activated as the competent department, responsible for the siting of the new collection points, the assignment of a licensed UCO collector (through a call of tender) and the maintenance of the UCO collection network, after the project end.

The assigned UCO collector is in close collaboration with the Technical University of Crete and the Municipal Waste Management Department to monitor the collection process and to further improve the systems operation and capacity. The Directorates of Primary and Secondary Education have been actively engaged supporting the educational campaign within the schools and the expansion of the collection network with additional UCO collection points in schools.

The InterMunicipal Waste Management Enterprise of West Crete (DEDISA) supported the pilot development and is initiating an expansion of the new collection scheme to other municipalities in Crete, by signing an MoU with the Technical University of Crete. The Hellenic Recycling agency has been contacted for potential replication of the scheme in continental Greece.

Funding unlocked due to the measure

The measure raised additional funding of 24.000€ for its implementation and further expansion. The small-scale biodiesel production unit and additional collection points were funded through an Interreg – MED project (COMPOSE). The system has been tested, improved, and put in operation as a sustainable solution. It triggered cooperation with the private sector and is expected to be maintained and operated after the project end.

3.2 LIM 5.2 – Promotion and creation of network for collecting of used cooking oil

Measure overview and results

A network for the collection of used cooking oil (UCO) from hotels and restaurants in Limassol has been created. In total, 8 hotels and 13 restaurants have been involved in this action. The Kaz Oil company is responsible for the collection of the UCO from the involved hotels and restaurants of Limassol. The UCO is collected twice per week from the involved businesses, enhancing the amount of oil that is collected and recycled. Through the implementation of this measure, a total amount of 18,480 kg of UCO was collected from the involved businesses in Limassol during 2019. The collected UCO is shipped abroad, specifically to the United Kingdom, Greece and Netherlands, where it is recycled and used as a sustainable biodiesel product in the mobility sector.

Moreover, hotels which were involved in this action were awarded as Green Hotels for providing their UCO for recycling during the ceremony that took place in 12th July 2019, as described in measure LIM 6.2 - Business cases for combined tourist and mobility products.

Figure 17: Collection of UCO from Hotels and Restaurants

Learning points and reflections

Collecting and recycling the UCO has positive effects on the local businesses as well as the environment. By recycling UCO, the disposal of the hazardous waste will be restricted. Also, the recycled UCO can be transformed to biodiesel, a clean fuel to be used in the transport sector, powering both logistics and private vehicles. The use of biodiesel in diesel engines emits significantly reduced CO_2 emissions compared to conventional fuels, resulting in reduction of GHG until 86%. Therefore, the recycling of UCO should be adopted from businesses and further promoted in global level.

The main barrier though for the collection UCO was that hotels and restaurants might have needed to be in the same road of the collection track to avoid excess movement around the city. However, a specific route was chosen based on how close they were to the route.

Residents and tourist involvement

Tourists and residents were informed about the collection and recycle activities of UCO from the entities involved in the measure through social media. Moreover, they supported the entities and they were happy to know that Limassol is becoming an even more environmentally friendly city.

Stakeholders active role

Key stakeholders expressed their willingness to participate in this measure and recycle the UCO from their hotels and restaurants. Limassol Tourism Board and Limassol Municipality have been involved in the process of the identification of hotels and restaurants and approach key stakeholders to become suppliers of UCO. Moreover, the Kaz Oil company ensures the successful collection of the UCO from the hotels and restaurants of Limassol.

Cumulative effect from the combination of CIVITAS measures in the site

Tourists enjoy their leisure trips in a friendlier and cleaner environment. The behaviour of local stakeholders was changed towards a sustainable environment. Also, several stakeholders that have not been involved in this measure will be aware about this action and will start participating in the UCO network and collect their UCO in the future.

Business models and intentions for long term delivery of measure

Used Cooking Oil is mostly generated in restaurants and hotels. With the creation of the network for the collection of the UCO and its successful use, more and more entities will be included in the network, increasing the amount of UCO used for the generation of biodiesel and increasing the supply amount of biodiesel. This can result in greater environmental gain from waste (UCO) management. Also, cities included in the UCO network can succeed in becoming more environmentally friendly.

The measure will continue after the end of the project since the recycled cooking oil is a successful business case for the companies that will collect it, reducing the amount of hazardous waste disposal and the cost required for waste management procedures. Additionally, the stakeholders want to continue keeping the label of green hotels, wanting to continue to contribute towards the preservation of the environment. Moreover, having the Green Label award might assist the awarded entities to attract more reservations from clients with increased environmental ethic and behaviour. Stratagem will keep the contact with Kaz Oil company after the end of the project, assisting in the increase of the stakeholders involved in the network and ensuring the successful collection of used cooking oil from the hotels and restaurants in Limassol district.

3.3 Cluster analysis

The energy provided from UCO through the transformation to biodiesel and use in the transport sector can bring important environmental and economic benefits to cities and regions, by: 1) reducing the hazardous waste amounts generated by HoReCa and residential sectors, which are disposed in the sewage water system of the cities; 2) reducing transport's pollutant emissions by replacing conventional fuels with biodiesel; 3) creating a value chain with significant added value to the local economy; and 4) contributing to a tourism destination green label.

In this context, the main objective in this cluster was to evaluate the feasibility of local production of biodiesel from UCO as an alternative energy source for diesel vehicles, conducting extensive research to define and assess an operational scheme for implementing an optimised UCO-to-biodiesel chain. Economic and environmental benefits at a local level were also assessed.

In Rethymno, the measure starting point was a growing concern on how to minimise the negative impacts of a hazardous waste produced mainly in the residential and tourism sectors by exploiting it locally as an energy resource, supplying the public fleet. Currently, UCO is transported to the mainland to be transformed in biodiesel, incorporated into the diesel mix and transported back to the island of Crete for distribution. This figures an unsustainable process with high economic and environmental costs. Within the measure, partners studied the feasibility of a local chain of UCO for biodiesel production to exploit locally the economic value of this resource. In order to increase the efficiency of the measure, local partners expand the UCO collection to the household sector as well.

The legislation is the main barrier, hindering so far, the completion of the full value chain, because it prohibits the small scale decentralised production of biofuels and their direct use in transport, requiring their export from the island to be transformed in biofuel and incorporated in the diesel mix. The implementation of good practices in other countries, where the legislation allows the decentralised production of biodiesel and its use in transport (in a proportion higher than the maximum mix required by the EU), was a strategy used for the negotiation process with the National Authorities to review the legislation anticipating a more flexible law modification.

The optimisation of the collection circuits was another issue addressed by Rethymno, through the installation of smart sensors in UCO collectors located in public spaces, to monitor the oil level, temperature and to prevent theft. Smart sensors sent data to an online platform, to assist the management of the collection process, allowing significant gains for the operator, including the reduction of fuel consumption for the collection fleet. The measure has strong potential for replication in other cities where UCO collection is already implemented or planned to be implemented.

One way found by the partners to fine-tune the process and access the interest of the stakeholders was to launch a tender to grant the UCO collection service. In this way, partners

were able to understand whether the service and the model designed followed the practices and interests of investors in the market.

Limassol is in a preliminary stage of development of the UCO valuation process, focusing its efforts on a pilot UCO collection project in the HoReCa sector, involving a simple collection network with a few hotels and restaurants. The exchange of information and experiences with Rethymno can benefit Limassol, supporting both the implementation of technological solutions and the preparation of appropriate legislation.

In summary, the main recommendations that emanate from the experience of the partners, the implementation processes and the results obtained, are as follows:

- **Preliminary study –** The carrying out of a preliminary feasibility study of a UCO exploitation chain, from the resource collection to biodiesel transformation and distribution, allows to identify the potential and the needs, to overcome barriers, reduce risks, and support the decision-making process.
- **Interventions towards adequate regulation –** The creation of local or regional regulation is needed to support the implementation of UCO to biodiesel local value chains, at a small-scale decentralised production.
- **Stakeholders engagement –** The active involvement of key stakeholders, public and private, in the launch of demonstration projects is important for obtaining successful results and achieving the desired replicating effect. Develop solutions that reduce operation and maintenance costs and simplify proceedings are decisive to engage stakeholders.
- **Design of business models –** The design of business models is important to plan and support the sustainability of the solutions in the long term.