Act 4.5 Malinska Municipality Pilot

D 4.5.1 Comprehensive report with results achieved during pilot implementation local experience

WP4: Pilots: small technological investments, equipment installations and new services start-up

Document: Public			
Responsible partner: University of Split **Involved partners: All**			
Version	**Status**	**Date**	**Author**
1.0	First Draft	30/01/2020	University of Split
1.1	Second Draft	06/03/2020	University of Split
1.2	Final document	17/10/2022	University of Split
Notes:			

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Executive summary

This document represents D .1.1 Roadmap and evaluation report, setting the overall framework for DEEP-SEA pilot implementation, monitoring and evaluation. Coordinated by University of Split, this document presents a description of project pilots, provide the steps for pilot implementation and the KPIs useful for pilot monitoring and evaluation. It finally provides the structure of pilot reports, where results of pilot preparation, implementation, monitoring and closure should be reported periodically by partners responsible for each pilot, in order to compile a final list of lessons learnt and recommendations which will be used for service continuation and improvement in pilot areas and replication of experience outside DEEP-SEA sites.

1. Introduction

WP4 will develop and implement new sustainable mobility solutions in selected pilot sites to enhance the available services for passengers and tourists in Adriatic marinas. A new integrated approach for the inland, costal and maritime mobility services will be promoted during the project life and will continue after, thanks to its transferability actions. In order to achieve the highest impact on the marinas since the very beginning, partners will fine-tune their pilot actions according to the analysis performed in WP3, i.e. of best available solutions (Act.3.1), best practice in management and investment models (Act.3.2) and AS IS analysis of passengers' flows, needs and expectations, current mobility patterns, energy consumption and emissions (Act.3.3).

Marinas operators of DEEP-SEA pilot sites and relevant PAs are expected to keep the sustainable mobility services and energy efficiency solutions installed during the pilots fully operational in the coming years, as a starting point for further installations and increase of the range of e-sharing services, thanks to the investment plans defined for each pilot site in DEEP-SEA Act. 3.4.

The installation of the ECS for e-vehicles and e-boats will boost e-mobility in the marinas and in nautical sector in general: DEEP-SEA pilot sites will trigger further new installations along the Adriatic Sea considering the increasing demand of charging services for e-cars. The availability of e-charging stations for e-boats will support the increase of e-mobility, affecting also shipyards, operators involved in boat and yacht retrofitting and production of new boat models with electric engines.

The micro-grid installation will allow the production of energy from renewable sources and demonstrate the economic sustainability with reduction of costs in electric grid distribution and energy self-sustainability, particularly in sensitive island areas.

This document is intended to define a roadmap for the set-up of pilots, selection of results to implement in WP3 Investment Plans and to include in WP5 Guidelines, with particular attention

to terms of coherence with the overall programme and project objectives. It provides the monitoring framework for pilot evaluation through the KPIs here defined.

Pilots monitoring and measurement methodology will ensure coherence with project and Interreg Italia-Croatia Programme objectives as well, according to the agreed time plan and economic - financial sustainability. Designed as internal tool, this roadmap will ensure the correct monitoring and measurement of the new installations and e-services as well as action viability and transferability to other Adriatic Sea sites and beyond. Once the project is over, the monitoring system developed during the project life-time will be used as a tool for future monitoring of mobility services by MOs, defining KPIs for the evaluation of pilot impacts in terms of accessibility, quality of mobility services, eco-social sustainability, environmental impacts and energy efficiency. Stakeholders (MOs, PAs, end-users and others) will be called to validate the set of selected criteria and the pilot results.

Evaluation results will be collected by each pilot site every 6 months through specific pilot evaluation reports (D 4.1.2).

2. DEEP-SEA pilot description

DEEP-SEA will implement 5 pilot actions targeting marinas in 5 areas across the Italy-Croatia region, as follows:

- Venezia Giulia area, Italy, coordinated by LP ARIES and University of Trieste;
- Foggia area, Italy, coordinated by Province Foggia;
- Krk Island, Croatia, coordinated by Ponikve Krk;
- Malinska, Croatia, coordinated by the Municipality of Malinska-Dubašnica;
- Maslinisca-Solta, Croatia, coordinated by HL Dvorac.

The **Venezia Giulia pilot** area will be characterized by the:

- Startup of 1 e-car sharing services;
- Installation of 6 e-charging stations for e-vehicles;
- Installation of 3 racks with electric and muscular bicycle for sharing system;
- Installation of 1 microgrid system.

The **Foggia pilot** area will be characterized by the:

- Startup of 1 e-car sharing service for the Province of Foggia, linked to the main transport HUBs;
- Installation of 6 e-charging stations for e-vehicles and/or e-boats in the marinas selected;

- Installation of 2 racks with e-bike sharing system in the areas of Manfredonia and Vieste.

The **island of Krk pilot** area will be characterized by:

- Installation of 1 rack with electric and muscular bicycles for bike sharing services;
- Purchase of 3 e-scooter for sharing services and startup of 1 e-scooter sharing;
- Installation of 2 e-charging stations for e-cars;
- Installation of 2 e-charging stations for e-cars e e-boats;
- Installation of 1 microgrid system.

The **pilot Malinska Municipality** pilot area will be characterized by:

- Installation of 2 e-charging station: 1 combined for e-cars and 1 mooring for e-boats (in Porat Marina), a and 1 e-charging station for e-cars in Malinska;
- Installation of 1 rack with electric and muscular bicycles for bike sharing services;
- Purchase of 4 muscular and 4 e-bikes;
- Charging system for e-bikes and software for rental;
- Installation of 1 microgrid system.

The **pilot Maslinica-Solta** pilot area will be characterized by:

- Installation of 1 e-charging station for e-vehicles and 1 e-charging station for e-boats;
- Installation of 1 rack with electric and muscular bicycles for bike sharing services;
- Installation of 1 microgrid system;
- Startup of 1 e-car mobility service for tourist transport.

At the end of pilot implementation, each partner responsible will produce a final report with results achieved during pilot implementation such as local experience, findings and proposal for seamless integration (Act. 4.2.1, 4.3.1, 4.4.1, 4,5.1, 4.6.1).

2. Pilot phases

The implementation of pilots is divided into 3 individual phases:

- In the **preparatory phase** partners will have to deal with the concept design and its technical issues requirements, choose the location and arrange relations with the landowners in order to obtain permissions, if necessary, considering the related social aspects and the stakeholders involved. The partners, will then have to deal with the financial aspects, seeking negotiations with potential contractors and eventually preparing the technical specification and documentation required for the tender. Furthermore, partners will define the KPIs, the Key Performance Indicators needed to monitor and evaluate the implementation. Each partner should select the relevant KPIs and the method of measuring them, on the basis of

the type of pilot, local context, SHs involved, technical features and so on. In this phase partners should also define how the achievement of KPI targets will be measured and set the current situation for each KPI.

- In the **implementation and monitoring phase** partners will start to implement the pilot, including installation of equipment and small infrastructure, their testing, validation, service start up and operations. The progress will be closely monitored by each coordinating partner and KPIs measured periodically; progress should be reported back to the WP leader and reported into the 6-month evaluation report, one for each pilot. The pilot development will also involve local stakeholders, such as PAs responsible for local public transport, marinas operators, local and regional associations, tourism and promotion institutions. A direct action will be focused on the involvement of end-users testing the services quality and their usability. Pilots responsible will also provide feedbacks to both investment plans (Act. 3.4) and guidelines (Act. 5.1).

- In the **closure phase**, partners will compile the final documents with the results from the pilots, the lessons leant and recommendation for service continuation and replication. This information will be collected through the following documents:
  - A final 6-month evaluation report (D 4.1.2) in February 2021, delivered by University of Split;
  - The final Reports with pilot results, one for each pilot, by December 2022 (Act. 4.2.1, 4.3.1, 4.4.1, 4,5.1, 4.6.1);
  - The final results of KPIs measurements in the present Roadmap by December 2022.

  The documents above will be used for the transfer of results outside the project, as described in the Transferability Plan (D 5.4.1). The implemented services and installed equipment will remain on usage of the passengers and tourists for their inland and coastal mobility and will indirectly support the increase of e-boats in nautical mobility following project's closure.

3. Pilot monitoring and evaluation: KPIs

Below a list of KPIs is provided related to energy efficient and sustainable mobility and micro grids. Partners responsible for each pilot will select the more relevant KPIs for their sites and monitor them throughout the project.

3.1. Micro grid KPI

KPI Description		Values		
N.	KPI	Unit	Baseline (current sit.)	Target (to be achieved)

1	Energy produced using the photovoltaic system. This can be achieved using a meter at the DC MPPT output.	kWh (per month)	0	J: 11 71, 10 | F: 17 28, 68 | M: 28 82, 36 | A: 38 02, 18 | M: 45 84, 45 | J: 49 43, 02 | J: 52 57, 58 | A: 46 01, 87 | S: 33 81, 25 | O: 22 71, 59 | N: 12 16, 04 | D: 10 51, 88
2	Energy used for charging the e-cars should be logged. This can be achieved using a meter inside the CS.	kWh (per month)	0	J | F | M | A | M | J | J | A | S | O | N | D
3	Energy from the grid used to fuel the car. When the car is charging, the difference between the CS energy and the ugrid energy (storage + PV).	kWh (per month)	0	J | F | M | A | M | J | J | A | S | O | N | D
4	Charging station occupancy: the amount of time when e-cars are charging at the station should be logged.	hr (per month)	0	J | F | M | A | M | J | J | A | S | O | N | D
5	CO_2 emissions reduction due to the use of an e-car instead of a conventional car. This value should be calculated by multiplying the e-car travelled distance per month by the average CO2 emission of a conventional vehicle (123.4 g CO2/km Source: www.eea.europa.eu)	CO2 kg./month	0	**J | F | M | A | M | J | J | A | S | O | N | D**
6	Number of users using the CS	# People	0	
7	Stakeholders / users satisfaction / benefits from DEEPSEA pilot(s) through interviews / questionnaires	%	0	
8	Number of e-car monitored	# Car	0	
9	Number of e-cars involved in the project	# Car	0	
10	Number of E-CS monitored	# E-CS	0	
11	Number of implemented E-CS by DEEPSEA	# E-CS	0	
12	Number of stakeholders involved (municipalities, regional authorities, investors, companies…)	SH	0	
13	Photovoltaic self-consumption energy, i.e. the percentage of energy locally consumed compared to that produced.	%	0	
14	Number of e-car charging profiles collected (e-car charging power vs. time)	# profiles/ year	0	
15	Number of e-car discharging profiles collected (e-car discharging power vs. time)	# profiles/ year	0	
16	Number of main battery charging profiles collected (charging power vs. time)	# profiles/ year	0	
17	Number of main battery discharging profiles collected (discharging power vs. time)	# profiles/ year	0	

3.2. E-sharing services KPI

KPI Description		Values		
N.	KPI	Unit	Baseline (current sit.)	Target (to be achieved)
1	Number of e-vehicles monitored	# Car	0	
2	Number of e-vehicles involved in the project	# Car	0	
3	Number of users using the e-sharing services	# People	0	
4	Number of charging hours	#Hours/ year	0	
5	Number of charging calls	#calls	0	
6	Stakeholders / users satisfaction / benefits from DEEPSEA pilot(s) through interviews / questionnaires	%	0	

3.3. ECS for e-vehicles KPI

KPI Description		Values		
N.	KPI	Unit	Baseline (current sit.)	Target (to be achieved)
1	Number of e-car monitored	# Car	0	
2	Number of e-cars involved in the project	# Car	0	
3	Number of E-CS monitored	# E-CS	0	
4	Number of implemented E-CS by DEEPSEA	# E-CS	0	
5	Number of stakeholders involved (municipalities, regional authorities, investors, companies…)	SH	0	
6	Number of users using the CS	# People	0	
7	Number of charging hours	#Hours/ year	0	
8	Number of charging calls	#calls	0	

3.4. ECS for e-boats KPI

KPI Description		Values		
N.	KPI	Unit	Baseline (current sit.)	Target (to be achieved)
1	Stakeholders / users satisfaction / benefits from DEEPSEA pilot(s) through interviews / questionnaires	%	0	
2	Number of e-boats monitored	# boats	0	
3	Number of e-boats involved in the project	# boats	0	
4	Number of E-CS monitored	# E-CS	0	
5	Number of implemented E-CS by DEEPSEA	# E-CS	0	
6	Number of stakeholders involved (municipalities, regional authorities, investors, companies…)	SH	0	
7	Number of users using the CS	# People	0	
8				

3.5. Rack for bicycles and e-bikes

KPI Description	Values

N.	KPI	Unit	Baseline (current sit.)	Target (to be achieved)
1	Number of e-bikes monitored	# bike	0	
2	Number of e-bikes involved in the project	# bike	0	
3	Number of E-CS monitored	# E-CS	0	
4	Number of implemented E-CS by DEEPSEA	# E-CS	0	
5	Number of users using the CS	# People	0	
6	Number of bicycles monitored	# bike	0	
7	Number of bicycles involved in the project	# bike	0	
8	Number of implemented E-CS by DEEPSEA	# E-CS	0	
9	Number of users using the CS	# People	0	
10	Stakeholders / users satisfaction / benefits from DEEPSEA pilot(s) through interviews / questionnaires	%	0	

4. The pilot report structure

1. construction and commissioning of a charging station for electric cars and vessels in location Porat, and 1 charging station for electric cars in front of the Kindergarten, which will be a micro-grid system, connected to the electric power system and equipped with a photovoltaic module for the production of electricity;
2. construction and commissioning of a photovoltaic power plant, power 35 kW (micro-grid system) on the roof of the kindergarten in Malinska, which is connected to the power system;
3. construction and commissioning of a bike-sharing system for the reception of 4 classic and reception and charging of 4 electric bicycles located next to the kindergarten;
4. establishment of a car sharing system in the Municipality;

4.1. Pilot description and selection of KPIs

4.1.1. Short Description

The pilot of the Municipality of Malinska-Dubašnica consisted of:

- Installation of 2 ECS : 1 combined for e –cars and 1 mooring for e-boats, 1 ECS for e-cars, on two locations; E-car charging station with the output power of 2x22 kW
- Installation of 1 rack with electric and muscular bicycle for sharing system and purchase of at least 4 muscular bikes and 4 e-bikes; Charging system for e –bikes: 8 charging

stations / stands: 4 for electric bicycles compatible with the already existing charging system on the entire island of Krk and 4 for the muscular bikes

- Charging system for e –bikes and software for rental
- Installation of 1 Micro-grid system: photovoltaic plant 35 kW on the roof of the Kindergarten in Malinska; Photovoltaic powerplant has 94 solar panels with total installed power peak of 35,72 kW (380W x 94).
- Start up of 1 e-car sharing service for Malinska Area

4.1.2. Context analysis

Successful integration of the bicycle rental system into the existing bicycle sharing system on the island of Krk implies coordination by experts, which will allow timely flow of relevant technical information to the stakeholders involved, with the aim of minimizing integration costs and time.

4.1.3. The goal

The goal of pilot actions is to enable port users to have it accessible at the site to encourage users and visitors to use clean, renewable energy sourced solutions as the first choice option. The charging station has been established together with one of the biggest telecom operators in Croatia – T-Com to enable contactless payments, measure energy consumption and it allows roaming. It allows reservation and through an app developed for these stations is part of the network of 40.000 stations across Europe. Across the island, there are a total of 12 charging stations for a total of 24 cars at various locations for charging cars and 8 charging stations for up to 80 e-bicycles. In line with islands 'Krk - CO2 neutral island' strategy islands government plans to add more charging stations powered by micro-grid solution installed at locations to enable both residents and visitors to use clean, renewable energy daily. But also to encourage residents to switch from traditional energy sources to clean renewable energy.

4.1.4. Chosen key performance indicators

Increasing the communal standard contributes to increasing satisfaction among the residents of the local community, islanders and visitors who use the results of the investment, and the place becomes a more pleasant and attractive environment for housing, which retains the island population. The pilot also shows optimal economic indicators and fits into local, national and European development plans and strategies. The investments follows the principles of

sustainable steady growth and enable further development while following the principles of sustainable development and increasing the range and quality of the Municipality as destination and increase recognition on the global market.

4.2. Preparation phase

Charging stations are installed in two locations. One location is in front of the kindergarten in Malinska, where a charging station for electric cars with an output power of 2x22 kW has been installed. There is also control pylon and charging system for e-bikes: 8 charging stations/stands: 4 for e-bikes compatible with the already existing charging system on the entire island of Krk and 4 for the muscular bikes. Installations of ECS's are completed just outside kindergarten plot, on the intersection of two roads, where is the most convenient position for one ECS for e-bikes, and one ECS for e-cars. The municipality built charging stations and devices on public land, which it owns. The total area of the parcel is 66 m2. The charging station will be part of the micro grid system connected to the power system. Photovoltaic powerplant is on the roof of the kindergarten building with battery system. Photovoltaic powerplant has 94 solar panels with total installed power peak of 35,72 kW (380W x 94). The municipality obtained a building permit for the execution of the works, which was a long process due to waiting for public services. Public procurement was carried out for the contractor, which also required several months just to prepare the documentation, and then to carry out the entire procedure. The selected contractor, who was also the only applicant in the public procurement process, offered an amount higher than the estimated value by around €30,000, which unfortunately we had to accept because there was no other applicant.

4.3. Implementation and monitoring phase

Implementation phase

The implementation of the pilot project required the design and implementation of integrated technical systems testing so that conclusions and suggestions for future integrations can be drawn from local experience.

Monitoring phase

The testing procedure followed as closely as possible the recommendations listed in the European "Data Collection and Reporting Guidelines for European Electro-Mobility Projects". An appropriate data format has been used in order to guarantee the correct and accurate content and structure of the recorded data. Furthermore, this will enhance the interoperability and seamless communication between different systems.

4.4. Pilot closure

It is reasonable to assume that the implementation of the project will have significant positive environmental impacts that can be calculated quantitatively, and are based mainly on reduced use of petrol-powered means of transport in favor of electic ones and also in favour of public transport (car sharing system, bike-sharing system) which contributes to reduction of noise and the emissions of harmful gases.
The municipality is collaborating with various associations and companies such as 'Eko Krk', 'KD Ponikve' and 'KD Dubašnica' to ensure meeting goals of sustainability implementation in daily lives. As the owner of KD Dubašnica Municipality plans to hire KD Dubašnica and Ponikve to provide monitoring and servicing of new equipment and mobility solutions once installed to ensure minimal downtime.
Another potential risk towards reaching the full potential of the plan is the risk of consumers (residents and their guests) non utilizing renewable sources in the port. Malinska-Dubašnica Municipality aims to minimize this risk through active education and promotion of project through leaflets, web and social media campaign and users education on its goals and benefits for all involved.

5. Final pilot evaluation and lessons learned with list of KPIs to be filled in by task leader

PILOT EVALUATION
The pilot project, which included the installation of charging stations for e-cars, e-boats, the installation of rack for e-bikes and mechanical bikes, and the micro-grid system on the roof of the kindergarten in Malinska, has been successfully completed and is in operation. The best results will be seen this season when they are used by a larger number of users: guests and tourists. The demand for new technologies and green tourism is growing, and

sustainable energy is one of the indicators of the independent island of Krk and thus of the Municipality of Malinska-Dubašnica.

LESSONS LEARNED
Through this project, we encountered numerous challenges, gained a lot of knowledge about photovoltaic panels, e-mobility, sustainable energy without emissions and gases, we met the future stakeholders of the pilot project, and we are ready to continue cooperation and increase the number of charging stations and photovoltaics, in order to become even more energy independent.

6. GANTT

activity	R = responsible P = partecipation					start	end	2020									2021											2022										
	Venezia Giulia	Prov. Foggia	Krk Island	Mun. Malinska	Maslinica - Solta			3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
KPI definition	P	P	P	P	P													X	X	X																				
Preparatory phase	R	R	R	R	R																X	X	X	X	X	X	X	X												
Implementation phase	R	R	R	R	R																								X	X	X	X	X	X	X	X	X			
Monitoring phase	R	R	R	R	R																																	X	X	X
Final Evaluation Report	R	R	R	R	R																																	X		