D 4.1.2 Monitoring and assessment methodology
Final consolidated report

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

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Notes:			

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Executive summary

This document represents the Pilot Final Consolidated Report (D 4.1.2), outlining the results of the project pilots and pointing out the required changes to achieve the declared objectives, activities timeline and outputs. The deliverable D 4.1.1 Roadmap and evaluation report set the overall framework for DEEP-SEA pilot implementation, monitoring and evaluation. Elaborated by the University of Split, this document discusses the outcomes of the project pilots based on D 4.1.1 framework, and provides an overview and a summary of the pilot reports (D 4.2.1, 4.3.1, 4.4.1, 4.5.1 and 4.6.1) where results of pilot preparation, implementation, monitoring and closure of the 5 pilots have been reported. It finally presents a summary of the final list of lessons learnt and recommendations from each pilot that will be used for service continuation and improvement in pilot areas after the project end and the replication of the experience outside the DEEP-SEA sites.

1. Introduction

The DEEP-SEA fourth work-package (WP4) developed and implemented new sustainable mobility solutions in selected pilot sites to enhance the available services for passengers and tourists in the Adriatic marinas. A new integrated approach for the inland, costal and maritime mobility services has been promoted during the project life and will continue after the project end, thanks to its transferability actions. In order to achieve the highest impact on the marinas since the very beginning, project partners fine-tuned 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).

Within DEEP-SEA pilot sites, marinas operators and the relevant Public Authorities (PAs) are expected to maintain the sustainable mobility services and energy efficiency solutions installed during the project operational in the coming years. This represents a starting point for further installations, with the aim to increase 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 Electric Charging Stations (ECS) for e-vehicles and e-boats will boost e-mobility in the selected marinas and in the nautical sector in general; DEEP-SEA pilot sites will trigger further new installations along the Adriatic Coast 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 and in case of energy crises.

The pilots monitoring and measurement methodology (D 4.1.1) ensured coherence with the project and the Interreg Italy-Croatia Programme objectives as well, according to the agreed time plan and economic - financial sustainability. Designed as an internal tool, this roadmap ensured the correct monitoring and measurement of the new installations and e-services as well as action viability and transferability to other Adriatic Sea marinas 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 Mobility Operators (MOs), defining Key Performance Indicators (KPIs) for the evaluation of pilot impacts in terms of accessibility, quality of mobility services, eco-social sustainability, environmental impacts and energy efficiency.

2. DEEP-SEA pilot description

DEEP-SEA implemented 5 pilot actions targeting marinas in 5 areas across the Italy-Croatia Programme area, as follows:

1. Venezia Giulia area, Italy, coordinated by LP ARIES and University of Trieste;
2. Foggia area, Italy, coordinated by the Province of Foggia;
3. Krk Island, Croatia, coordinated by Ponikve Eco Krk;
4. Malinska, Croatia, coordinated by the Municipality of Malinska-Dubašnica;
5. Maslinisca-Solta, Croatia, coordinated by H.L. Dvorac.

Table 1 – Type of installation and equipment for each pilot site.

Pilot	Installations
Venezia Giulia area LP ARIES	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
Province of Foggia area PP11 Province of Foggia	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
Island of Krk area PP12 Ponikve Eco Krk	Installation of 1 rack with electric and muscular bicycles for bike sharing services
	Purchase of 4 e-scooter for sharing services and startup of 1 e-scooter sharing
	Installation of 3 stations for e-cars
	Installation of 1 e-chargin station for e-boat
	Installation of 1 microgrid system

Malinska Municipality area PP06 Municipality of Malinska-Dubašnica	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
	Purchase of 4 muscular and 4 e-bikes
	Installation of 1 microgrid system
	Installation of 1 rack with electric and muscular bicycles for bike sharing services
	Charging system for e-bikes and software for rental
Maslinica Solta area PP10 HL Dvorac	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

An overview of pilots' location and composition is presented in the Figure below.

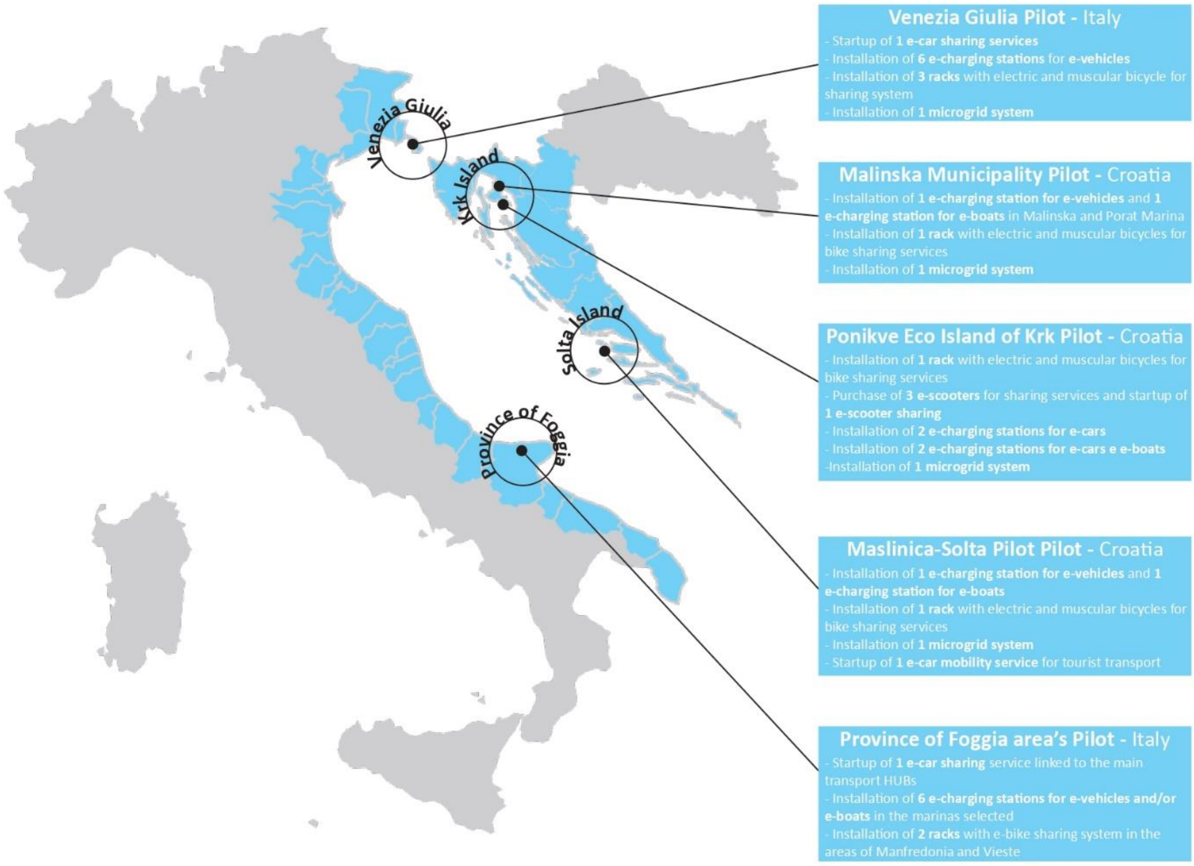

Figure 1 – Pilots location across the Adriatic Coast.

3. Overview of the pilots' phases: preparation, implementation and monitoring, closure and KPI

The implementation of the pilot actions was divided into 3 individual phases:

- In the **preparatory phase,** the project partners had 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 dealt with the financial aspects, seeking negotiations with potential contractors and eventually preparing the technical specification and documentation required for the tender. Furthermore, partners defined the KPIs, the Key Performance Indicators needed to monitor and evaluate the implementation. Each partner selected the relevant KPIs and the method for measuring them, based on the type of pilot, the local context, SHs involved, technical features and so on. In this phase, partners also defined how the achievement of KPI targets had to be measured and set the current situation for each KPI.

- In the **implementation and monitoring phase**, the partners implemented the pilot, including the installation of the foreseen equipment and the related small infrastructure; they tested the equipment and started up the sharing services. The progress was closely monitored by each coordinating partner and KPIs measured periodically; progress was reported back to the WP leader and reported into the 6-month evaluation report, one for each pilot. The pilot development also involved local stakeholders, such as PAs responsible for local public transport, marinas operators, local and regional associations, tourism and promotion agencies. A direct action focused on the involvement of end-users testing the services quality and their usability. Pilots responsible also provided feedbacks to both the investment plans (Act. 3.4) and the guidelines for energy efficient mobility (Act. 5.1).

- In the **closure phase**, partners compiled the final documents with the results from the pilots, the lessons leant and recommendation for service continuation and replication. This information was collected through 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) and the final results of KPIs measurements contained in the 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-vehicles in nautical mobility following project's closure.

Below the description of the single phases related to each Pilot Area.

Table 2 – Description of the preparatory phase of the DEEP-SEA pilots.

Preparatory phase	
Institutional name	**Description**

Venezia Giulia area **LP ARIES**	/
Province of Foggia area **PP11 Province of Foggia**	First, PP11 carried out a preliminary study to assess the specific needs of the private and public bodies that manage the most important marinas in the Foggia area, with the aim to support their lack of sustainable energy and transport models. The entire area where the equipment was located is within the seaports, and with the installation of e-bike stations, it was possible to connect this area to the town centers nearby. Public procurements were conducted using the national public procurement marketplace (MEPA) and all the procedures were carried out without any particular problem.
Island of Krk area **PP12 Ponikve Eco Krk**	As 53% of Krk CO2 emissions come from transportation, the island installed 12 chargers for 24 electric vehicles and 8 chargers for 80 e-bikes, the latter being part of a bike-sharing system. Ponikve has experience with photovoltaics (PV) installation on a waste management facility, and has access to experts as well as membership in local energy cooperative. Electricity produced is agreed not to be sold but used to charge Ponikve 3 older EV-s and supply implemented charging stations. Parcels of installation are owned by local municipalities and by the Ponikve company itself. All mobility stations are located close but outside of the old town center. Tendering procedure was prolonged due to COVID-19 crisis. Negotiations with maintenance and mobility app provider, and development of application, have been challenging also on the topic of providing free-of-charge service. The island relies on a great network of multilevel stakeholder cooperation. Institutions, businesses and NGO share the same vision of the island future in the domain of sustainability. Krk has an energy cooperative since 2012, and the municipalities recently established two companies to manage the energy transition; Island Krk Energy will coordinate the energy transition process, and Smart Island Krk will focus on smart processes and the digitalization of the island activities. Cooperation with NGO Moj otok (My Island) has been successful in organising an e-bicycle race on multiple occasions, promoting e-mobility and the DEEP-SEA project. Marina Punat, the largest marina in the northern Adriatic - and one of the signatories of DEEP-SEA Memorandum of Understading (MoU) - administered its users the DEEP-SEA Marina users' questionnaire, to collect data upon nautical mobility energy consumption and emissions.
Malinska Municipality area **PP06 Municipality of Malinska-Dubašnica**	Charging stations were 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 a control pylon and a 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 the partner had to accept because there was no other applicant.
Maslinica Solta area **PP10 H.L. Dvorac**	In the preparatory phase, the Marina pilot site was focused on a strategic analysis of the external factors that affect the pilot development. More specifically, the assessments of the strengths, weaknesses, opportunities, and threats of current and prospective competitors as well as the political, economic, and technological influences that affect the Martinis Marchi Marina pilot site. The main focus of Marina was on the following procurement actions: procurement of the (1.) Electric charging stations (ECS) for boats/vessels, which included the purchase of a freestanding charging device for boats with two connection points and rated power 2x22 kW (3-phase, 400 V/ 32 A/50 Hz, with connection version type 2. Moreover, it included the purchase of a kit with equipment for monitoring, preparatory works, and

	excavation of the cable duct for laying power cables. Furthermore, the procurement of (2.) Electric charging stations (ECS) for cars included the purchase of freestanding charging devices for cars. More specifically, charging devices with two connection points and rated power 2x22 kW (3-phase, 400 V/32 A/50 Hz, with connection version type 2). In addition, the procurement included the purchase of a kit with equipment and software for monitoring devices, preparatory works, excavation of the cable duct for laying power cables, and marking parking places for parking electric cars along with sign installation. Moreover, the procurement of (3.) E-mobility & sharing services included both infrastructural works and the purchase of an electric car and six electric bicycles for renting. The infrastructural works implied the installation of the system for charging six electric bicycles, preparatory construction works, and excavation of the cable duct for laying power cables, setting up and parameterizing the e-bike system, connecting to a local LAN, and establishing software control over the operation of the station. Finally, the procurement of (4.) The Microgrid system included 42 photovoltaic (single crystal) panels equipped with connecting cables (1600x990x40 mm with rated power min. 320 Wp). Construction works included preparatory work, excavations, finishing work, and purchase of small building materials and supplies. Regarding the financial elements that have been considered, a simplified cost-benefit and multiple criteria analysis (MCA), and ROI analysis have been conducted for comparing actions in which rough financial and economic flow estimates were used to calculate financial and economic performance indicators. The total investment referred to the above mentioned four procurement activities (ECS for boats, ECS for cars, E-mobility and sharing services, and Microgrid system), was 100,000 EUR. The investment was 85% financed by European Structural and Investment Fund (ESIF), more specifically European Regional Development Fund (ERDF), and 15% was financed by the Marina itself.

Table 3 – Description of the implementation and monitoring phase of the DEEP-SEA pilots.

Implementation and monitoring phase	
Institutional name	**description**
Venezia Giulia area **LP ARIES**	/
Province of Foggia area **PP11 Province of Foggia**	In the installation phase, due to the COVID-19 pandemic period and the Ukrainian crisis in particular, leading to a supply shortage of semiconductors, some delays were registered. No particular difficulties were reported in the technical installation of the ECS except for a little delay with administrative authorization. The element of success was also the collaboration with a local company that won the procurement procedure, and that already had all the practical know-how in sharing systems and in e-charging station along with a good knowledge of marinas areas. The monitoring system is fully automated and based on a software dashboard application. The system allows to monitor the following items: e-charging station: disruptions, number of charging sessions, and KW/h supplied; e-sharing bike station: disruptions, GPS, number of rentals, duration of rentals, number of customers.
Island of Krk area **PP12 Ponikve Eco Krk**	As predicted by the SWOT analysis, the COVID crisis had a negative impact both on the implementation phase and on the monitoring stage. The installation of pilots had run into obstacles due to the COVID-19 pandemic. The price of materials has changed, especially steel prices increased on the market. No applicants submitted to the first announcement of the public tender, so the partner had to repeat the tender. In the second call, PP12 contracted the procurement and installation of the necessary equipment. Factor for success is also collaboration with prior existing operator of bike sharing systems on the Island. The company offers sharing app in a number of Croatian cities. Under somewhat different conditions for customers, Ponikve's SC were added on map and Go2Bike app of UTE. Baseline indicators have been met and investments implemented successfully. Monitoring insight is achieved using e-mobility application connected to the implemented CS installations (Go2Bike). Maintenance was somewhat obstructed (contractor's staff members got COVID in summer 2022) which as a consequence had made part of the bike fleet unavailable to clients during

	couple of weeks, leading to lower monitoring numbers. CS in front Ponikve building is not at the town center as most of the e-bike stations, but it has a lot of interested users among users of car charger and also among employees of Ponikve (over 140 employees).
Malinska Municipality area PP06 Municipality of Malinska-Dubašnica	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. 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.
Maslinica Solta area PP10 H.L. Dvorac	The Microgrid system was placed in PP10 storage facility, in the part closest to the exit wall for easier access to the outside and almost directly under the bike stands and e-vehicle charger also for easier access. Inside the storage facility, a separate room was made with PVC doors and barriers for safety reasons. Air conditioning and ventilation system was placed for temperature control. Solar panels were placed on top of PP10 main facility in the marina. Panels are also connected with cables to the marina storage facility (microgrid system). For e-bike stands and e-vehicles charger implementation, immovable parts of the e-bike stands and e-vehicle charger were placed in concrete on the part of the parking area. That part of the parking area was painted with all the necessary signs for the equipment. In addition, the cables from PP10 storage facility (microgrid system) were brought directly to them. The e-bike stand and e-vehicle charger were screwed on the parts in the concrete and connected to the necessary cables to them. E-boat charger implementation started by removing stone panels from the marina floor and drilling the wall of the storage facility (microgrid system) out to the marina. In addition, we made the new stone structure to hide the part of the cables that go next to the breakwater wall to the e-boat charger. This was the most difficult part of the project, as the partner had to find and replace the stone panels that broke in the removal part of the process with the same ones. For data collection, PP10 took the data that were the easiest to gather through the apps for the new implemented systems (Go2Bike and Victron energy). The most important thing for the marina is energy production and consumption for all components as it is in the process of building a new marina, starting from next year. Solar panels give more than enough electricity to maintain all components of the project pilot. Consumption compared to production for 2021 was higher by 128% as they implemented the panels and monitoring system mid-year. For 2022 (until 01.10.), consumption was just 33% of the produced energy. The e-car that is part of the project and the e-sharing system is very economical and environmentally friendly. The e-car was driven for 11.032 km and it used the e-vehicle charger for 487,64 h, saving 79,31 CO_2 kg. /month. Its sharing service was used by 51 people. The e-vehicle charger was used by 25 people (3 of them were employees of H.L. Dvorac Ltd.), it monitored 22 e-cars that were plugged into the charger for 758,52 h and consumed 219,52 kWh per month. E-bikes were used by 236 users until now. They are mostly people that come by boat, as there are approximately 6 to 8 people on the boats that come to our marina, and 1 user takes 4 bikes or more. E-boat charger was not used so much as there is only a small number of e-boats on the Adriatic. PP10 had only 3 e-boats, one of them used during the marina winter berth offer.

Table 4 – Description of the closure phase of the DEEP-SEA pilots.

Closure phase	
Institutional name	**description**

Venezia Giulia area LP ARIES	
Province of Foggia area PP11 Province of Foggia	The pilot plan will be completed with the installation of 4 additional e-bike stations in Foggia city center, with the aim to connect the main intermodal Hub Railways Station, Bus Station, and Foggia Airport. Within DEEP-SEA, the Gargano area had a very important occasion to develop a transport service with less environmental impact, especially in the main touristic centers, thus initiating a small network of sustainable services. For the optimal completion of the project, it would have been useful to activate e-car pooling services to connect marinas with tourist attractions and city centers.
Island of Krk area PP12 Ponikve Eco Krk	As for the general crisis of the worldwide economy, it seemed like the sector of e-mobility will slow down too. However, contrary to Ponikve SWOT analysis, the interest for renewable energy and electric cars actually increased. The crisis started with COVID, but continued with distortion in energy market influenced by the Russian-Ukrainian conflict, which forced people to think of long-term investments in energy independence. Although Krk is an easily accessible starting point and a renowned destination for yachting and small boat cruises - with the best marinas and seven local ports with developed nautical services – the monitoring results revealed that Krk has not been attracting e-boats with its DEEP-SEA charging station, as the electric boat fleet is non-existent. On the Krk island, there is no demand for e-boat charging station. Therefore, the installation implemented through the DEEP-SEA project has no effective users. PP12 recommendation for improvement and replication of similar projects would be to create a pilot for the conversion of motor boat to e-boat, and to promote e-nautical travel. As mentioned, Krk has compatible network of CS and rental bicycles on multiple locations, but they are mostly available to users during summer season. The DEEP-SEA project offered the use of EV and CS all year round, and noted existing interest for the infrastructure. With the idea to reach zero CO2 emissions, a goal set by Island Krk's energy strategy itself, it would be desirable to secure access to existing CS and e-bicycle services on the island to residents in winter as well.
Malinska Municipality area PP06 Municipality of Malinska-Dubašnica	It is reasonable to assume that the implementation of the project will have significant positive environmental impacts that can be calculated quantitatively, and that are based mainly on the reduced use of petrol-powered means of transport in favor of electric ones and in favor of public transport (car sharing system, bike-sharing system). This would then contribute to the 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 that the consumers (residents and their guests) are not interested in using the port equipment. Malinska-Dubašnica Municipality will minimize this risk through the active education and promotion of the DEEP-SEA project through leaflets, web and social media campaign and users education on its goals and benefits for the community.
Maslinica Solta area PP10 H.L. Dvorac	The DEEP SEA project showed us the relevance of renewable energy sources and their integration in every modern marina. As mentioned in the monitoring phase, data collection was the most important part of the project. PP10 gathered relevant information that will support them in choosing which components to implement in their upcoming projects. Like always, PP10 learned the most from their mistakes. E-bikes that were in partner's budget for the project are not suitable for island terrain, as most of the beautiful beaches and bays are only accessible by off-road trails. In addition, for their use throughout the whole island, PP10 had to put at least one more location with charging stations in cooperation with the Municipality of Šolta. For solar panels, it was the only location to place them in the current layout of the marina, but their place is too close to the sea and now PP10 is concerned about future maintenance, which could become a problem because of the salt. Pros of the project were e-boat and e-vehicle chargers that brought PP10 new clients, for the marina, hotel, and Island. The e-boat charger was used the least but still brought us one winter berth and it was the third fully electric Salona 47 in the world. The e-vehicle charger brought many guests to the hotel and nearby apartments. Chargers are still scarce in Croatia, especially on the islands. E-car users choose our island just because of the charger location. The SUV e-car that we got for the project helped us organize tours to island vineyards

	and old army locations more easily. Not to mention it is more economical and marina guests praise the choice of environmentally friendly option for the touring car.

4. Summary of the lesson learnt and recommendation from the pilots

Table 5 – Lessons learnt and recommendation for each pilot site.

Lesson learnt	
Institutional name	**Description**
Venezia Giulia area **LP ARIES**	/
Province of Foggia area **PP11 Province of Foggia**	
Island of Krk area **PP12 Ponikve Eco Krk**	Ponikve area had the opportunity to test and improve organizational knowledge and to improve practically the technical knowledge related to photovoltaic cells, battery systems and the use of apps and new technologies. During project implementation and monitoring, awareness of stakeholders rose on a matter of unused opportunity to implement electric boats to local fleets. KPI for e-boat charging were negligible, and electrification of the nautical sector should be further stimulated. Another lesson is improvement idea for future CS: Bicycle CS at Ponikve does not have a roof nor other cover, so e-vehicles are exposed to the weather conditions the whole year round. This will impact maintenance of the vehicles negatively. As a better example to follow, partners of Foggia province installed bicycle CS in shielded area under a roof.
Malinska Municipality area **PP06 Municipality of Malinska-Dubašnica**	Through this project, Malinska Municipality encountered numerous challenges, gained a lot of knowledge about photovoltaic panels, e-mobility, sustainable energy without emissions and gases. The Municipality met the future stakeholders of the pilot project, and it is now ready to continue cooperation and increase the number of charging stations and photovoltaics, in order to become even more energy independent.
Maslinica Solta area **PP10 H.L. Dvorac**	During the implementation of the DEEP-SEA project, the Marina has expanded its business by introducing new services, which have contributed to positioning the Marina as an environmentally sustainable marina. In addition, during the project implementation, the key elements of the concept of green port management were implemented in the marina's development. Moreover, as a result of several meetings and local workshops with relevant stakeholders, a transparent and active stakeholder participation has been set-up. Therefore, a shift from sustainability as a legal obligation to sustainability as an economic driver with continuous striving towards innovation in process and technology has been activated.

5. Micro-grid KPI

Table 6 – KPI chart used by each pilots during the monitoring phase

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 0	J F M A M J J A S O N D
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	

5.1. PP06 Mun. Malinska: list of KPIs from the year 2022

Table 7 – Micro grid KPI

<table>
<tr><th colspan="2">KPI Description</th><th colspan="3">Values</th></tr>
<tr><td>N.</td><td>KPI</td><td>Unit</td><td>Baseline (current sit.)</td><td>Target (to be achieved)</td></tr>
<tr><td>1</td><td>Energy produced using the photovoltaic system. This can be achieved using a meter at the DC MPPT output.</td><td>kWh (per month)</td><td>0</td><td><table><tr><td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td></tr><tr><td>1171,10</td><td>1728,68</td><td>2882,36</td><td>3802,18</td><td>4584,45</td><td>4943,02</td><td>5257,58</td><td>4601,87</td><td>3381,25</td><td>2271,59</td><td>1216,04</td><td>1051,88</td></tr></table></td></tr>
<tr><td>2</td><td>Energy used for charging the e-cars should be logged. This can be achieved using a meter inside the CS.</td><td>kWh (per month)</td><td>0</td><td><table><tr><td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>3</td><td>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).</td><td>kWh (per month)</td><td>0</td><td><table><tr><td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>4</td><td>Charging station occupancy: the amount of time when e-cars are charging at the station should be logged.</td><td>hr (per month)</td><td>0</td><td><table><tr><td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>5</td><td>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)</td><td>CO2 kg./month</td><td>0</td><td><table><tr><td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>6</td><td>Number of users using the CS</td><td># People</td><td>0</td><td></td></tr>
<tr><td>7</td><td>Stakeholders / users satisfaction / benefits from DEEPSEA pilot(s) through interviews / questionnaires</td><td>%</td><td>0</td><td></td></tr>
<tr><td>8</td><td>Number of e-car monitored</td><td># Car</td><td>0</td><td></td></tr>
<tr><td>9</td><td>Number of e-cars involved in the project</td><td># Car</td><td>0</td><td></td></tr>
<tr><td>10</td><td>Number of E-CS monitored</td><td># E-CS</td><td>0</td><td></td></tr>
<tr><td>11</td><td>Number of implemented E-CS by DEEPSEA</td><td># E-CS</td><td>0</td><td></td></tr>
<tr><td>12</td><td>Number of stakeholders involved (municipalities, regional authorities, investors, companies…)</td><td>SH</td><td>0</td><td></td></tr>
<tr><td>13</td><td>Photovoltaic self-consumption energy, i.e. the percentage of energy locally consumed compared to that produced.</td><td>%</td><td>0</td><td></td></tr>
<tr><td>14</td><td>Number of e-car charging profiles collected (e-car charging power vs. time)</td><td># profiles/ year</td><td>0</td><td></td></tr>
<tr><td>15</td><td>Number of e-car discharging profiles collected (e-car discharging power vs. time)</td><td># profiles/ year</td><td>0</td><td></td></tr>
<tr><td>16</td><td>Number of main battery charging profiles collected (charging power vs. time)</td><td># profiles/ year</td><td>0</td><td></td></tr>
<tr><td>17</td><td>Number of main battery discharging profiles collected (discharging power vs. time)</td><td># profiles/ year</td><td>0</td><td></td></tr>
</table>

5.2. PP10 Dvorac: list of KPIs from the year 2022

Table 8 – Microgrid KPI

<table>
<tr><th colspan="2">KPI Description</th><th colspan="3">Values</th></tr>
<tr><td>N.</td><td>KPI</td><td>Unit</td><td>Baseline (current sit.)</td><td>Target (to be achieved)</td></tr>
<tr><td>1</td><td>Energy produced using the photovoltaic system. This can be achieved using a meter at the DC MPPT output.</td><td>kWh (per month)</td><td>1076,45</td><td><table><tr><td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td></tr><tr><td>141,71</td><td>232,84</td><td>751,42</td><td>1259,90</td><td>1583,03</td><td>1736,19</td><td>1761,93</td><td>1372,94</td><td>848,09</td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>2</td><td>Energy used for charging the e-cars should be logged. This can be achieved using a meter inside the CS.</td><td>kWh (per month)</td><td>219,52</td><td><table><tr><td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td></tr><tr><td>0</td><td>23,24</td><td>27,82</td><td>51,88</td><td>0</td><td>95,82</td><td>677,75</td><td>729,49</td><td>369,69</td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>3</td><td>Energy from the grid used to fuel the car. When the car is charging, the difference between the CS energy and the grid energy (storage + PV).</td><td>kWh (per month)</td><td>219,52</td><td><table><tr><td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td></tr><tr><td>0</td><td>23,24</td><td>27,82</td><td>51,88</td><td>0</td><td>95,82</td><td>677,75</td><td>729,49</td><td>369,69</td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>4</td><td>Charging station occupancy: the amount of time when e-cars are charging at the station should be logged.</td><td>hr (per month)</td><td>71,00</td><td><table><tr><td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td></tr><tr><td>0</td><td>3,23</td><td>6,88</td><td>9,07</td><td>0</td><td>32,867</td><td>187,93</td><td>222,97</td><td>176,07</td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>5</td><td>CO2 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)</td><td>CO2 kg./month</td><td>79,31</td><td><table><tr><td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td></tr><tr><td>51,46</td><td>81,32</td><td>63,18</td><td>76,88</td><td>63,05</td><td>92,92</td><td>70,34</td><td>141,91</td><td>143,27</td><td></td><td></td><td></td></tr></table>11032km</td></tr>
<tr><td>6</td><td>Number of users using the CS</td><td># People</td><td>25</td><td></td></tr>
<tr><td>7</td><td>Stakeholders / users satisfaction / benefits from DEEPSEA pilot(s) through interviews / questionnaires</td><td>%</td><td>0</td><td></td></tr>
<tr><td>8</td><td>Number of e-car monitored</td><td># Car</td><td>22</td><td></td></tr>
<tr><td>9</td><td>Number of e-cars involved in the project</td><td># Car</td><td>1</td><td></td></tr>
<tr><td>10</td><td>Number of E-CS monitored</td><td># E-CS</td><td>1</td><td></td></tr>
<tr><td>11</td><td>Number of implemented E-CS by DEEPSEA</td><td># E-CS</td><td>1</td><td></td></tr>
<tr><td>12</td><td>Number of stakeholders involved (municipalities, regional authorities, investors, companies…)</td><td>SH</td><td>0</td><td></td></tr>
<tr><td>13</td><td>Photovoltaic self-consumption energy, i.e. the percentage of energy locally consumed compared to that produced.</td><td>%</td><td>33%</td><td>till 01.10</td></tr>
<tr><td>14</td><td>Number of e-car charging profiles collected (e-car charging power vs. time)</td><td># profiles/ year</td><td>0</td><td></td></tr>
</table>

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	

Table 9 – E-sahring services KPI

KPI Description		Values		
N.	KPI	Unit	Baseline (current sit.)	Target (to be achieved)
1	Number of e-vehicles monitored	# Car	1	
2	Number of e-vehicles involved in the project	# Car	1	
3	Number of users using the e-sharing services	# People	51	
4	Number of charging hours	#Hours/ year	380,33	till 01.10
5	Number of charging calls	#calls	0	
6	Stakeholders / users satisfaction / benefits from DEEPSEA pilot(s) through interviews / questionnaires	%	0	

Table 10 – 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	3	
3	Number of e-boats involved in the project	# boats	0	
4	Number of E-CS monitored	# E-CS	1	
5	Number of implemented E-CS by DEEPSEA	# E-CS	1	
6	Number of stakeholders involved (municipalities, regional authorities, investors, companies…)	SH	0	
7	Number of users using the CS	# People	3	
8				

Table 11 – bike KPI

KPI Description		Values		
N.	KPI	Unit	Baseline (current sit.)	Target (to be achieved)
1	Number of e-bikes monitored	# bike	6	
2	Number of e-bikes involved in the project	# bike	6	
3	Number of E-CS monitored	# E-CS	6	
4	Number of implemented E-CS by DEEPSEA	# E-CS	6	
5	Number of users using the CS	# People	161	Do 01.10

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	

5.3. PP12 Ponkive list of KPIs from the year 2022

Table 12 – Microgrid KPI

KPI Description		Values													
N.	KPI	Unit	Baseline (current sit.)	Target (to be achieved)											
				J	F	M	A	M	J	J	A	S	O	N	D
1	Energy produced using the photovoltaic system. This can be achieved using a meter at the DC MPPT output.	kWh (per month)	0				420	6710	7730	7130	6340	3760	2600		
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				150	80	260	340	220	130	60		
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				50	70	160	240	120	30	50		
4	Charging station occupancy: the amount of time when e-cars are charging at the station should be logged.	hr (per month)	0					11,28	32,26	1,316	72,67	0	0		
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				123,4	65,81	213,5	279,8	181,0	107,0	49,36		
6	Number of users using the CS	# People	113												
7	Stakeholders / users satisfaction / benefits from DEEPSEA pilot(s) through interviews / questionnaires	%	100												
8	Number of e-car monitored	# Car	3	*E-cars of Ponikve purchased prior to DEEP SEA project											
9	Number of e-cars involved in the project	# Car	0												
10	Number of E-CS monitored	# E-CS	11												
11	Number of implemented E-CS by DEEPSEA	# E-CS	3												

12	Number of stakeholders involved (municipalities, regional authorities, investors, companies…)	SH	6	
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	

Table 13 – E-sharing services KPI

KPI Description		**Values**		
N.	KPI	Unit	Baseline (current sit.)	Target (to be achieved)
1	Number of e-vehicles monitored	# Car	3	
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	

Table 14 – ECS KPI

KPI Description		**Values**		
N.	KPI	Unit	Baseline (current sit.)	Target (to be achieved)
1	Number of e-car monitored	# Car	0	0
2	Number of e-cars involved in the project	# Car	0	0
3	Number of E-CS monitored	# E-CS	3	3
4	Number of implemented E-CS by DEEPSEA	# E-CS	3	3
5	Number of stakeholders involved (municipalities, regional authorities, investors, companies…)	SH	0	
6	Number of users using the CS	# People	113	
7	Number of charging hours	#Hours/ year	385,85	
8	Number of charging calls	#calls	184	

Table 15 – ECS 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	1	
5	Number of implemented E-CS by DEEPSEA	# E-CS	1	1
6	Number of stakeholders involved (municipalities, regional authorities, investors, companies…)	SH	5	
7	Number of users using the CS	# People	0	
8				

Table 16 – E- bikes KPI

KPI Description		**Values**		
N.	KPI	Unit	Baseline (current sit.)	Target (to be achieved)
1	Number of e-bikes monitored	# bike	88	
2	Number of e-bikes involved in the project	# bike	8	4 e-bike and 4 e-scooter
3	Number of E-CS monitored	# E-CS	11	
4	Number of implemented E-CS by DEEPSEA	# E-CS	1	
5	Number of users using the CS	# People	667	
6	Number of bicycles monitored	# bike	4	4 muscular bikes
7	Number of bicycles involved in the project	# bike	4	
8	Number of implemented E-CS by DEEPSEA	# E-CS	1	
9	Number of users using the CS	# People	76	
10	Stakeholders / users satisfaction / benefits from DEEPSEA pilot(s) through interviews / questionnaires	%	6	

Below soma results from the data extrapolated from the KPI that the Pilots collected during the monitoring phases:

- E-cars and e-moblity services have been mostly used during the summer season. This is related to the strong seasonality of the marinas, where most of the touristic activities are concentrated from May-June to September-October;
- PP10 pilot Maslinica - Solta has shown a Photovoltaic self-consumption energy around the 33% of the energy locally consumed compared to that produced;
- The energy produced using the photovoltaic system, measured in kWh (per month) has been significantly high in the pilot of PP10 Ponikve Eko Krk: 34690 kWh (per month), demonstrating the high-energy efficiency of the technical installations;
- The CO2 emissions reduction due to the use of an e-car instead of a conventional car, measured in CO2 kg./month has been significantly high in the pilot of PP10 Ponikve Eko Krk: 1019, 87 CO2 kg./month
- Considering the pilot PP10 Maslina – Solta and the PP12 Ponikve Eko Krk, more than 300 users have been monitored in the use of e-mobility services (e-cars, e-boats, e-sharing services) and more than 230 have been monitored only in the use of e-bikes, demonstrating

a high interest of users in the e-mobility services to move in the surrounding of the marina's areas.

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