

D.5.1.5 PORT MANAGEMENT APPLICATION

Working Package n: 5	WP5 Developing tools and harmonizing services for a sustainable intermodal mobility
Activity (n. and description):	5.1. Analyzing existing, re-use and development of new smart technological tools and advanced solutions
Deliverable (n. and description):	D.5.1.5. No.1 Port management application
Responsible Partner:	PP16 – County Port Authority of Zadar
Status:	Final
Deadline (as from the original AF):	02/2023
Finalized on:	06/2023

1. Background, scope and description of the pilot action

The pilot area of Zadar County has embarked on an initiative to promote sustainable mobility solutions, focusing specifically on waste oil management in ports. To address the challenges, needs, and gaps in this area, the installation and testing of three modern tanks equipped with built-in tank gauges and an IT application for displaying and relaying information have been implemented. One of the primary challenges in the pilot area is effectively managing waste oil generated in ports. Traditional methods of waste oil disposal have often been inefficient and environmentally harmful. Finding sustainable solutions for collecting, storing, and disposing of waste oil is crucial to minimize its impact on the environment. The existing waste oil management systems in the ports of Zadar County may suffer from a lack of real-time monitoring and information dissemination. Without proper monitoring, it becomes challenging to assess the current status of waste oil tanks, leading to potential inefficiencies in collection and disposal processes. Another significant challenge is the inefficient allocation of resources for waste oil management. Without accurate and up-to-date information on the status of waste oil tanks in each port, it can be difficult to distribute resources effectively, such as scheduling collection services or allocating personnel and equipment. The current process of manually collecting data and reporting information on waste oil tanks is time-consuming and prone to errors. It often involves personnel physically checking each tank, recording measurements, and manually transferring the data to relevant stakeholders. This manual approach can lead to delays, inaccuracies, and difficulties in coordinating waste oil management activities. Without a transparent and accountable waste oil management system, it becomes challenging to track the movement of waste oil, identify potential leakages or spillages, and ensure compliance with environmental regulations. A lack of transparency and accountability can hinder the overall sustainability of the port operators. The installation and testing of modern tanks with built-in tank gauges and an IT application aim to address these challenges and gaps in the pilot area.

The PP16's pilot action, i.e., the installation of modern oil tanks in 3 ports under CPA Zadar jurisdiction – Biograd na Moru, Kukljica, and Sali, aimed at achieving following benefits:

- The built-in tank gauges provide accurate and up-to-date information on the waste oil levels in each tank. This enables real-time monitoring and allows stakeholders to have a comprehensive overview of the waste oil situation in the ports.
- The IT application can display and relay information on waste oil tanks, providing relevant stakeholders with easy access to data such as tank levels, collection schedules, and maintenance requirements. This improves coordination, decision-making, and resource allocation.
- With the modern tanks and IT application, the process of data collection and reporting can be automated. Tank measurements can be automatically recorded and transmitted to the application, reducing the need for manual data entry and minimizing errors. This streamlines administrative processes and improves efficiency.
- Real-time data on waste oil tank levels allows for more efficient resource allocation. Collection services can be scheduled based on actual needs, optimizing the utilization of

personnel and equipment. This leads to cost savings and improved operational effectiveness.

- The IT application facilitates transparency and accountability by providing a digital record of waste oil tank data. It enables tracking the movement of waste oil, ensuring compliance with regulations, and identifying potential issues promptly. This enhances the sustainability of port operations and promotes responsible waste management practices.

2. Implementation of the pilot action (including a description of the externalized services/supplies/works)

PP16's pilot action was the installation of modern oil tanks in 3 ports under CPA Zadar jurisdiction – Biograd na Moru, Kukljica, and Sali, in cooperation with external suppliers and experts – TEXNIX d.o.o. company for equipment purchase and Informatika Fortuno d.o.o. for the development of the application. Pilot action was implemented based on the detected needs of Zadar County ports which contribute to the development of the sustainability of the ports and, consequently, foster the shift of CPA Zadar ports to environmentally friendly transport modes. These new eco tanks have a capacity of 1000 liters and a built-in tank gauge with the system to relay information. The monitoring of the current fill status of oil tanks are digitalized and remotely monitored by the port authority via an IT application. For simplicity of transport and maintenance, tanks have an armature for collection and discharge. Thus, the installation and testing of the system for vessel oil residue management presents a concrete solution for reducing the environmental impact at the regional level of Zadar County. Also, this concrete action will increase the safety standard of passengers and safe access to ports in long term. Tanks have built-in sensors and a SIM card that communicate with the software which allows it to send a signal when tanks need to be emptied. At 75 percent, the application starts to send warn messages. Below are photos of the 3 tanks marked with Interreg/MIMOSA visibility logo, as well as screenshots of the application.

Tanks

1. Port Kukljica



2. Port Biograd na Moru



3. Port Sali

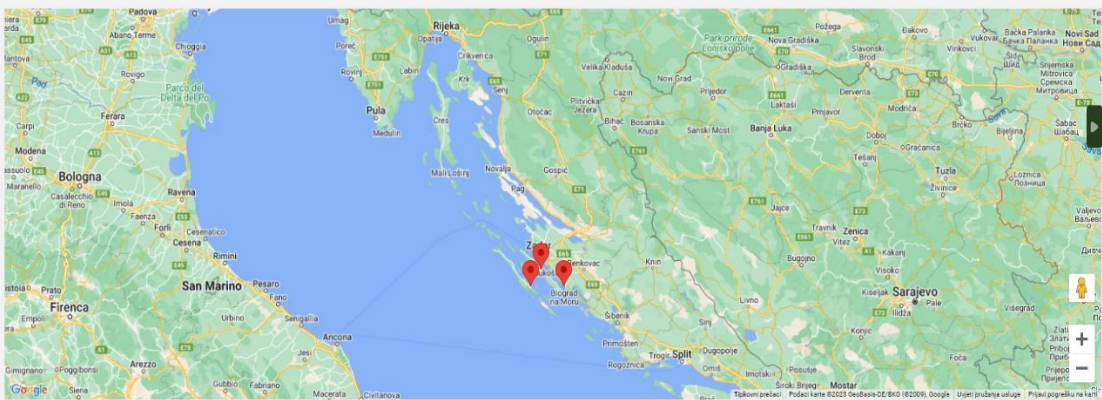


Application

Locations of tanks

Spremnici otpadnih ulja kikokotlar@gmail.com

Lokacije spremnika:



Activated tanks

Spremnici otpadnih ulja kikokotlar@gmail.com

Spremnici

Naziv	Opis	Lokacija	Status baterije	Status popunjenosti	Status kvara/blokade	Ažurirano
Spremnik 1	Spremnik u Biogradu	Biograd na Moru, Hrvatska	-	<75%	Nije u kvaru	30.06.2023. 08:30
Spremnik 2	Spremnik u Kukljici	Kukljica, Hrvatska	-	<75%	Nije u kvaru	30.06.2023. 13:18
Spremnik 3	Spremnik na Dugom Otoku Sali	Sali, Hrvatska	-	<75%	U kvaru	09.05.2023. 12:56

15 45 90 Stranica 1 od 1 (3)

Napunjenost spremnika

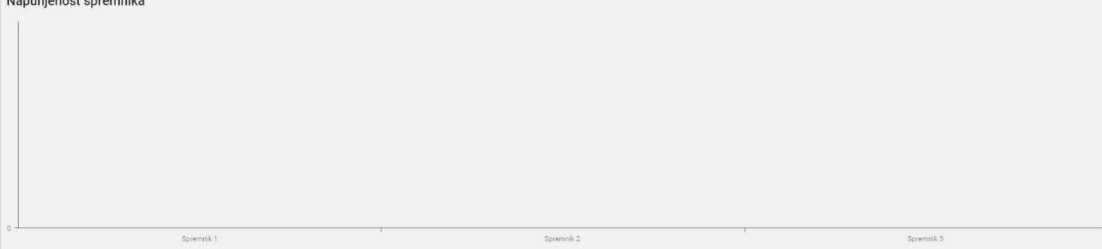
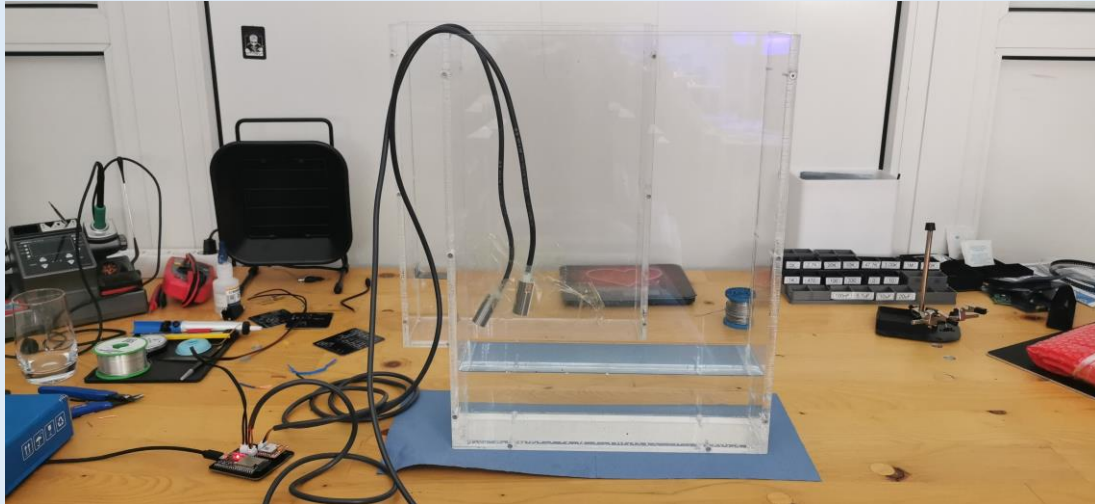
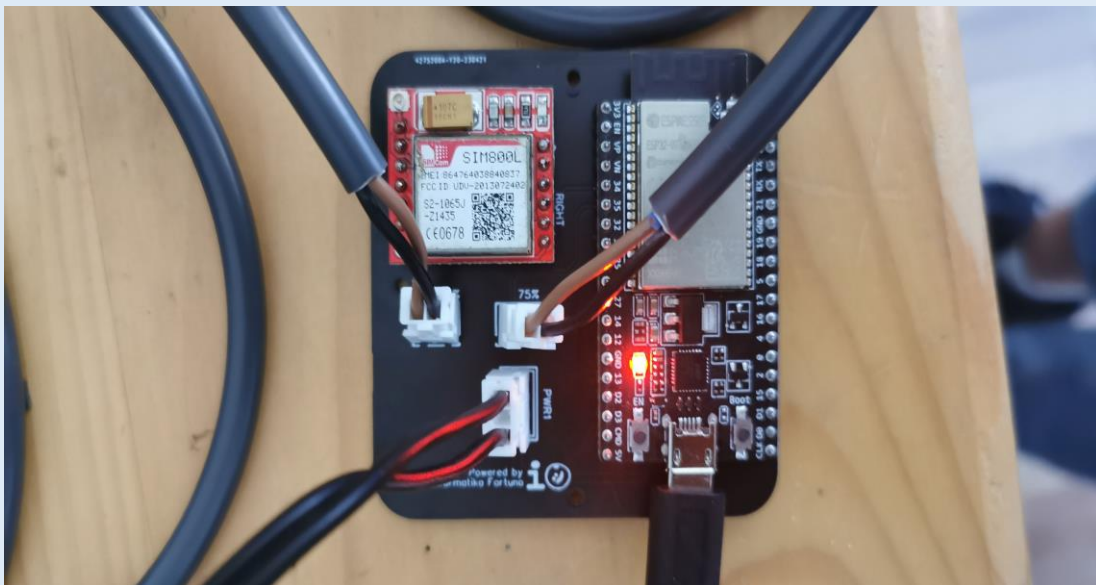


Image shows the test environment, which consists of a water tank, probes for fluid detection, and electronics that control the system.



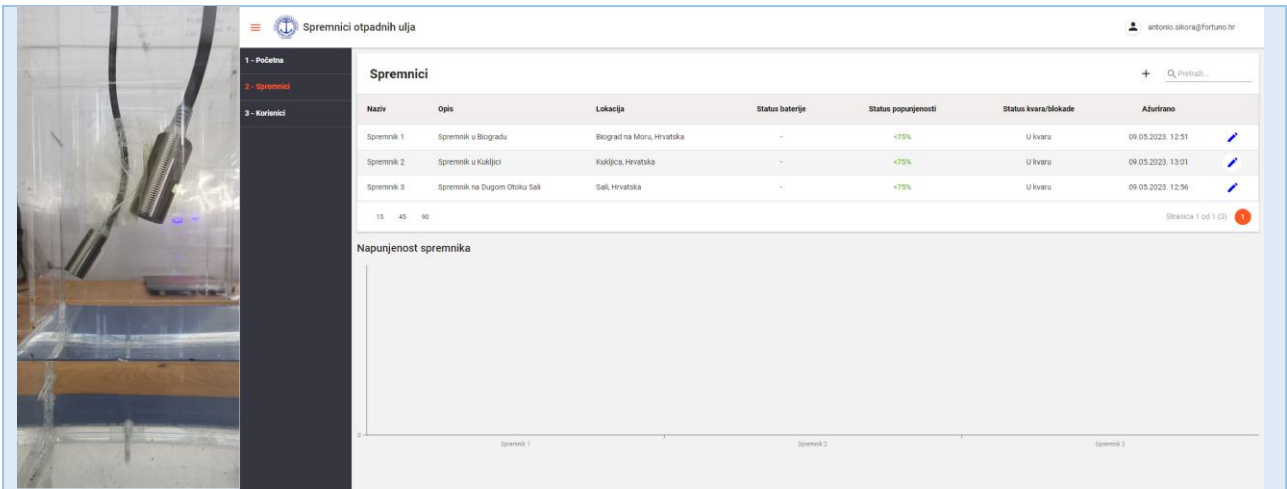
Test environment

Image shows the electronic board with the microprocessor and SIM module, as well as connected probes and power supply.



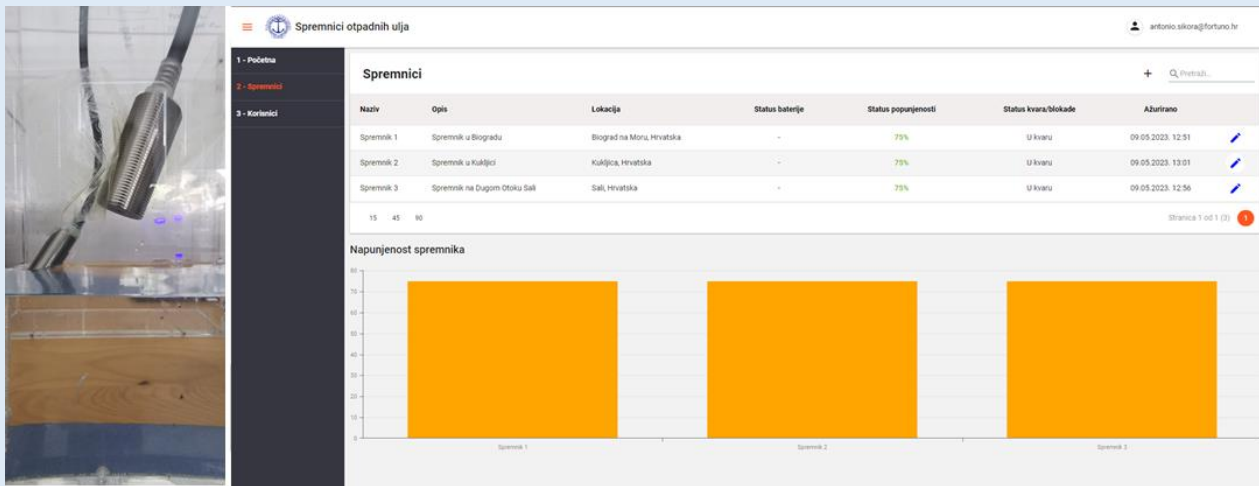
Electronic board

The following picture shows the probes when the water does not touch them (left) and the display of the window for monitoring the condition of the tank (right).

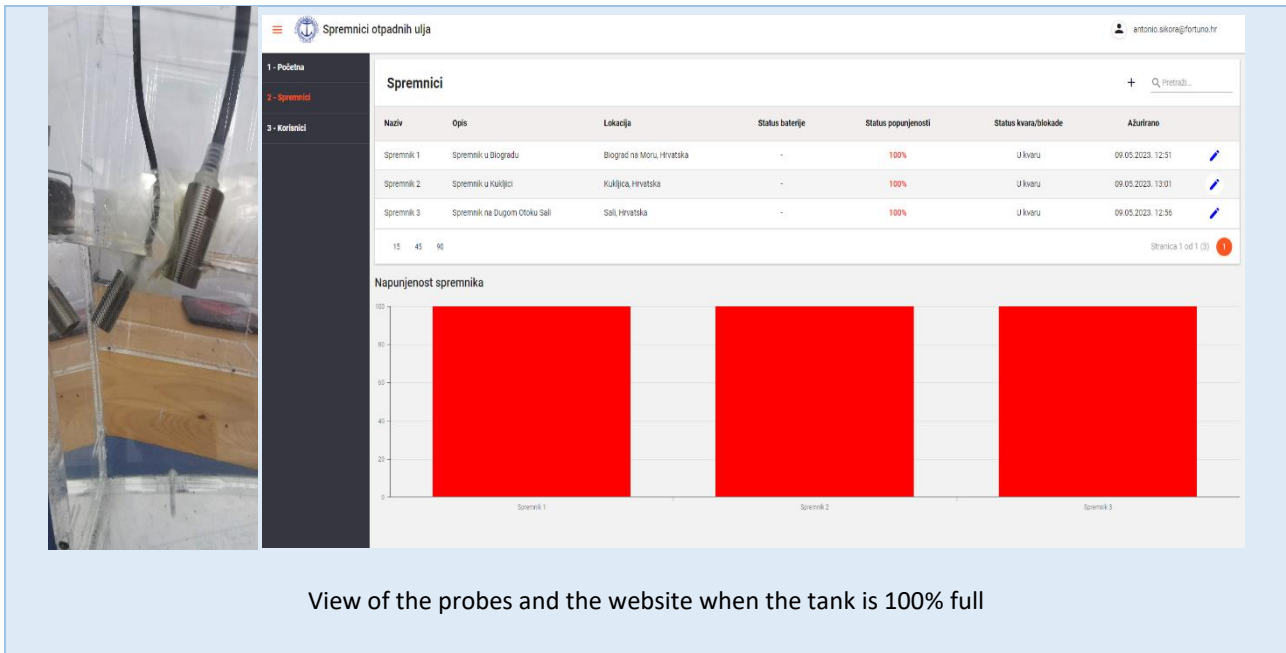


View of the probes and the website when the tank is <75% full

The following pictures show the testing of the probes in contact with water.



Display of probes and website at 75% charge



The screenshot displays a web interface for monitoring oil tanks. On the left, a vertical menu lists '1 - Početna', '2 - Spremnici', and '3 - Korisnici'. The main content area is titled 'Spremnici otpadnih ulja' and shows a table of three tanks. Below the table is a bar chart titled 'Napunjenost spremnika' showing 100% fill levels for all three tanks. A photo on the left shows the physical probes connected to the tanks.

Naziv	Opis	Lokacija	Status baterije	Status popunjenosti	Status kvara/blokade	Ažurirano
Spremnik 1	Spremnik u Biogradu	Biograd na Moru, Hrvatska	-	100%	U kvaru	09.05.2023. 12:51
Spremnik 2	Spremnik u Kukuljici	Kukuljica, Hrvatska	-	100%	U kvaru	09.05.2023. 13:01
Spremnik 3	Spremnik na Dugom Otoku Sali	Sali, Hrvatska	-	100%	U kvaru	09.05.2023. 12:56

Napunjenost spremnika

Bar chart showing 100% fill level for all three tanks (Spremnik 1, Spremnik 2, Spremnik 3).

View of the probes and the website when the tank is 100% full

3. Information about stakeholders role/involvement

The implementation of the pilot action provides an opportunity to engage and raise awareness among various stakeholders involved in waste oil management, including port authorities of involved ports Biograd na Moru, Kukljica, and Sali, waste management companies from involved local area, shipping companies, as well as involved IT company. Through active involvement and collaboration, stakeholders can gain a deeper understanding of the importance of sustainable transport solutions and the role they play in achieving broader sustainability goals. This can lead to increased cooperation, knowledge sharing, and the adoption of sustainable practices beyond waste oil management. Port authorities play a crucial role in overseeing the operations and management of the ports. They are responsible for implementing and enforcing sustainable practices, including waste oil management. In the pilot action, port authorities are involved in coordinating the installation of modern tanks, ensuring compliance with regulations, and providing support for data collection and reporting. They also play a role in disseminating information to other stakeholders and promoting the adoption of sustainable transport solutions. Waste management companies are instrumental in the collection, storage, and disposal of waste oil. They are responsible for regularly emptying the waste oil tanks and transporting the collected waste oil for appropriate treatment or recycling. In the context of the pilot action, waste management companies collaborate with port authorities to optimize collection schedules based on real-time tank data. They also contribute to the proper maintenance of the tanks and ensure compliance with environmental regulations. Shipping companies operating in the ports have a direct impact on waste oil generation. They play a vital role in implementing sustainable practices related to waste oil management on their vessels. Shipping companies are responsible for separating waste oil from other ship-generated waste and properly storing it in designated tanks. Their involvement is crucial in ensuring the efficient and safe collection of waste oil from vessels and its transfer to the port's waste oil tanks. The involvement of IT solution providers was essential for the successful implementation of the IT application used in the pilot action. They collaborated with port authorities and other stakeholders to design, develop, and deploy the application that enables real-time monitoring, data collection, and reporting. IT solution providers worked closely with the port authorities to customize the application based on the specific requirements of the waste oil management system in Zadar County. They provided technical support, training, and maintenance of the application.

4. Lessons learnt and conclusions

The pilot action of installing modern tanks with built-in tank gauges and an IT application for waste oil management in the ports of Zadar County contribute to the promotion of more sustainable transport solutions in several ways. By effectively managing waste oil in the ports, the pilot action helps reduce environmental pollution and minimize the negative impact on local ecosystems. Proper collection, storage, and disposal of waste oil prevent leakages, spillages, or inappropriate handling, ensuring that the waste oil does not contaminate soil, water bodies, or the air. This promotes a cleaner and healthier environment, aligning with sustainable transport objectives. The real-time monitoring of waste oil tank levels enables more efficient resource allocation. With accurate information on tank capacities and fill levels, collection services can be scheduled based on actual needs, optimizing the utilization of transportation resources. This improves the overall efficiency of waste oil management, reducing unnecessary trips, fuel consumption, and associated greenhouse gas emissions. The IT application provides stakeholders with valuable data on waste oil tank levels, collection schedules, and maintenance requirements. This data can be analyzed to identify patterns, trends, and areas for improvement in waste oil management practices. By leveraging data-driven insights, decision-makers can make informed choices to optimize operations, reduce waste generation, and implement sustainable transport strategies effectively.

The pilot action itself represents a technological innovation in waste oil management. By introducing modern tanks with built-in tank gauges and an IT application, the pilot area demonstrates a commitment to adopting advanced technologies to address sustainability challenges. By addressing waste oil management challenges and promoting more sustainable practices in the pilot area, the installation and testing of modern tanks with built-in tank gauges and an IT application contribute to a holistic approach to sustainable transport. It sets a foundation for future initiatives and demonstrates the feasibility and benefits of integrating technology, data-driven decision-making, and stakeholder collaboration in promoting sustainable transport solutions in Zadar County. Finally, effective stakeholder engagement and involvement in the pilot action ensured that all relevant perspectives are considered, knowledge is shared, and actions are collectively implemented. Collaboration among stakeholders fostered a holistic approach to sustainable transport solutions, promoted transparency, and facilitated the exchange of best practices. Ultimately, their active participation contributes to the long-term success and scalability of the pilot action implemented in Zadar County.

5. Problems found and adopted solutions

The first problem PP16 encountered was the definition of exact pilot action due to the unfeasibility of public procurement procedure for initially planned PA with the objective of developing a Port management application that would ensure the supervision of all vessels in the ports under its jurisdiction. CPA Zadar manages over 140 ports open to public traffic, among which are passenger, nautical, and utility ports, with different needs and characteristics. While defining the project task /ToR and consulting with experts, especially IT experts, CPA Zadar was unable to determine how the application in question should be designed in order to get all the necessary information in a timely manner. The decision to repeat the already published tender for the port management application was not feasible as it presented a great challenge and risk to be successfully finalized in general, especially within the MIMOSA project by its end date. However, by investigating needs of Zadar ports, PP16 concluded that new (above-described) pilot action would present good alternative solution, as the installation and testing of the system for vessel oil residue management presents a concrete solution for reducing the environmental impact at the regional level of Zadar County. Also, this concrete action will increase the safety standard of passengers and safe access to ports in long term. Second difficulty was to connect the tanks with the application from a technological point of view. However, the IT company found a solution fast as they advised to procure additional piece of equipment that would successfully transfer the data from tanks to the application. All obstacles were successfully overcome by PP16 in cooperation with their experts.

6. Expected follow up (after project closure)

The most significant benefits for future use of pilot action results are, e.g., savings in time and human resources, especially on remote islands where there is a lack of them (there is no need to visit locations unnecessarily until the tanks are completely full), and reduction of pollution, which means optimizing the frequency of waste collection. The application will be used to analyse the amount of waste in an area, so it can be seen from the data that the container in an area is filling up too quickly and whether there is a need to install additional containers. By utilizing the lessons learned and the enabling technologies, CPA Zadar can promote new sustainable mobility solutions in its city/regional area. The experience gained from the pilot action serves as a foundation for further initiatives and collaborations. The knowledge and expertise acquired can be applied to explore additional sustainable transport solutions such as smart parking systems, electric vehicle charging infrastructure, or integrated transportation planning. By building on this experience, CPA Zadar can continue to lead the way in promoting sustainable mobility and contribute to a greener and more efficient transportation system.

In terms of long-term usage and durability, the pilot action in waste oil management is expected to demonstrate its effectiveness and sustainability over time. By continuously monitoring and evaluating the performance of the installed tanks and IT application, necessary adjustments and improvements can be made to ensure their long-term functionality and reliability. This includes regular maintenance of the tanks, updating the IT application to accommodate any changes or advancements in technology, and addressing any operational challenges that may arise.

The pilot action can be transferred to other contexts and areas, contributing to the broader adoption of sustainable mobility solutions. The experience gained from the initial implementation in CPA Zadar within MIMOSA project serves as a valuable reference point for other cities and areas, allowing them to learn from successes and challenges, adapt the approach to their specific needs, and achieve sustainable waste oil management in their respective locations.