

NET4mPLASTIC PROJECT

WP5 – Act. 5.1 Implementation of the
platform (HW, SW) with field and
laboratory data

D 5.1.7

Software User and Maintenance Manual

June, 2022 - Version 1.1

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Acronyms / Abbreviations

ACRONYM	DEFINITION
EWS	Early Warning System
MP	Microplastic
OBU	On board Unit
PP	Project Plan
PT	Project team
TC	Technical task coordinator
TGS-ML	Technical Subgroup on Marine litter, European Union expert group On marine litter
TM	Task Manager
UML	Unified Modelling Language
WP	Workpackage

1 Introduction

1.1 Background of the project

The main goal of the NET4mPLASTIC project is to achieve an efficient monitoring system for plastic and MP distribution along the Croatian and Italian coastal and marine areas in order to improve the environmental coastal and marine sea quality conditions.

According to doc R1, the WP5 deals with the design implementation of the EWS - Early Warning System including:

- a control centre, based on system hardware and network (Prosoft), and a EWS application (Hydra Solutions) integrated with the transport model and external systems (such as the oceanographic model - (Marche Region);
- Integrated Marine Drone, for collection of MP - microplastic, and geolocalized water indicators on the route (Hydra Solutions);
- Integrated Marine OBU, a unit to be installed on board of ships for improved MP collection with geolocalized water indicators on the route (Hydra Solutions).

The design shall be carried out with the modern system engineering approach based on UML - Unified Modelling Language (Hydra Solutions). UNITS and RERA SD will provide data for the first set up of the platform related to MP. Based on this WP, the transport model will be developed in WP4. The development of the EWS platform integrated with the transport model will be done in WP5.

The activities planned for WP5 are the following:

- development of the EWS - Early Warning System data center platform and integration with the transport model (WP4)
- development of the UAV/marine drone for real-time data acquisition
- testing and calibration
- business simulation for testing the solution with real users –
- final assessment of the solution, including a CBA—cost benefit analysis and the preparation of the business plan.

The main expected output will be:

- EWS integrated platform, implemented and tested
- Training for the required personnel and users - Assessment of the platform.

The required main software modules of the EWS platform will be:

- MP Transport model, providing data with distribution and concentration,
- MP WebGIS platform, for: a) Display MP data (historical, actual forecast, 24-72h forecast) b) Early warning provision, based on the transport model c) Data entry, recording & replay
- MP DB, the DB for collecting data
- A mobile APP, for starting/closing the field activities and for data reporting
- Firmware for marine remote units - Integration with external system, for meteo/other data

The coordinator will be Hydra Solutions. The EWS SW platform will be developed by Hydra Solutions, with the support of Marche Region for the transport model, and Prosoft for localization, the ICT

implementation, the integrated testing, training and support for maintenance activities. UNITS will coordinate the assessment of the platform. The other partners involved will give contribution for data entry, as target user, and for preparation of the required documentation. The user target group will be based on the main project partners, institution, regions and councils. They will be involved in the design stage for collecting the main needs, for testing and user training of the solution. The target group will be required to use the system during the business simulation, and provide feedback.

The expected reports within WP5 are the following:

- D 5.1.4 –Hardware and Network Integration Report (Report): this deliverable will provide a report with details on integration of the network and other hardware required for the system;
- D 5.1.5 –Test procedures and reporting (Report): this deliverable will provide the procedures for testing the data centre and the integrated solution in the test bed environment, and the reporting of the tests done to assure the quality of the solution provided;
- D 5.1.6 –Hardware & Network Maintenance Manual (Document); this deliverable will provide the manual for the maintenance of the hardware and the network of the system;
- D 5.1.7 –Software User and Maintenance Manual (Document); this deliverable will provide the manual for the maintenance of the software and the User manual for the operators
- D 5.2.4 – Marine OBU / Drone Test Procedure and Report (Document): this deliverable will provide the procedures for testing the drones and the OBU, and the reporting of the tests done to assure the quality of the solution provided;
- D 5.2.5 –Marine OBU / Drone Maintenance Manual (Document); this deliverable will provide the manual for the maintenance of the Drone and OBU;
- D 5.2.6 – Marine OBU / Drone User Manual (Document); this deliverable will provide the User manual for the operators;
- D 5.3.1 – Data Centre Hardware and Network Facility implemented (Hardware, report), in this deliverable is relevant to the implementation of the data centre for the integrated solution, hardware and the network facility, and the preparation of the AS BUILT document describing the data centre facility;
- D 5.3.2 – Remote Units and Data Centre Communication Test Procedure and Report (Document); this deliverable will provide the procedures for testing the communication integration between remote units and the data centre, and the relevant reporting of the tests done to assure the quality of the solution provided;
- D 5.3.3 – Data Centre Test Procedure and Report (Document): this deliverable will provide the procedures for testing the features of the solution provide in the data centre, and the relevant reporting of the tests done to assure the quality of the solution provided, that will be done in cooperation with the main stakeholders;
- D 5.3.4 – Integrated System Final Test Procedure and Report (Document): this deliverable will provide the procedures for the integrated test cases testing the integrated solution, and the relevant reporting of the tests done to assure the quality of the solution provided, that will be done in cooperation with the main stakeholders.
- D 5.4.1 – Training documentation (document): this deliverable is relevant to the implementation of the required documentation for performing training to the personnel involved in the business simulation (as defined in the WP3.3 and the design of the solution);

- D 5.4.2 – Training assessment (report): this deliverable is relevant to the implementation of the training to be done for the personnel involved in the business simulation, with a reporting on evaluation of the training;
- D 5.4.4 – Questionnaire for platform assessment (report) this deliverable is relevant to the preparation of a questionnaire for evaluation of the platform from the user point of view involved in the business simulation;
- D 5.4.5 –Cost Benefits Analysis – CBA of the platform (Document); this deliverable will provide a final document with lessons learnt during the real use of the platform, an evaluation of the benefits of the platform, and costs for full exploitation of the solution, including the future recommendations on potential improvement, and including a business plan for a full implementation of the platform.

1.2 Purpose of the report

This document is the **deliverable D.5.1.7 – Software User & Maintenance Manual**: it provides the manual for the maintenance of the software and the User manual for the operators.

This deliverable is within the activity 5.1 of the Net4mPlastic project – Implementation of the platform (Hw/Sw) for field and lab data. This activity shall have as input the deliverables of WP3.3 relevant to the design of the solution to proceed with the execution of the following tasks:

- Implementation of custom software modules and data interfaces with existing data modelling software, GIS applications and other commercial software modules;
- Integration and configuration of the Data Centre hardware infrastructure as test bed for the required implementation;
- Implementation of the DataBase;
- Population of the DataBase with existing historical data and new data;
- Installation of the commercial and custom software
- Internal testing of the integrated platform.

The coordinator will be Hydra Solutions in cooperation with Prosoft, UNIFE, UNITS, Marche Region. The purpose of this document is summarised as follows:

- Description of the implementation of the software functionalities (user manual).
- Description of the main maintenance tasks to be carried out periodically to assure good performances of the system.

1.3 Reference documentation

No	Title	Rif/Report N.	Published by
[R1]	APPLICATION FORM - NET4mPLASTIC Project -	Application ID:	Lead

	New Technologies for macro and Microplastic Detection and Analysis in the Adriatic Basin 2014 - 2020 Interreg V-A Italy - Croatia CBC Programme Call for proposal 2017 Standard - NET4mPLASTIC Priority Axis:Environment and cultural heritage	10046722, dated 30/06/2017	applicant: UNIVERSITY OF FERRARA
[R2]	D 5.1.4 –Hardware and Network Integration Report (Report)	HYD514-REP-001.0	ACT5.1 – Net4Mplastic
[R3]	D 5.1.5 – Test Procedures & Reporting Report	HYD515-PRO-001.0	ACT5.1 – Net4Mplastic
[R4]	D 5.1.6 –Hardware & Network Maintenance Manual	HYD516-MAN-001.0	ACT5.1 – Net4Mplastic
[R5]	D 5.2.4 – Marine OBU / Drone Test Procedure and Report	HYD524-PRO-001.0	ACT5.2 – Net4Mplastic
[R6]	D 5.2.5 –Marine OBU / Drone Maintenance Manual	HYD525-MAN-001.0	ACT5.2 – Net4Mplastic
[R7]	D 5.2.6 – Marine OBU / Drone User Manual	HYD526-MAN-001.0	ACT5.2 – Net4Mplastic
[R8]	D 3.3.1 – EWS Requirements definitions based on the stakeholders and users’ needs, through questionnaires and specific meeting	HYD331-SPE-001.0	ACT3.3 – Net4Mplastic
[R9]	D 3.3.2 – EWS Hardware Architecture and network design (central Data Centre Hardware Architecture Client/Server, Data network architecture and related communication segments)	HYD332-SPE-001.0	ACT3.3 – Net4Mplastic
[R10]	D 3.3.3 – EWS Software Architecture design (data modelling software, GIS applications, early warning detection software, etc.), the Relational Database to manage all collected data with related meta data, the communication Front-End for web remote access, the Data Centre Software Interfaces for users	HYD333-SPE-001.0	ACT3.3 – Net4Mplastic
[R11]	D 3.3.4 – EWS Hardware and other software Components Specifications design (Integrated Marine Drone and Marine OBU, with details of required components (hardware and firmware), firmware and other software components (mobile	HYD334-SPE-001.0	ACT3.3 – Net4Mplastic

	apps for managing the drones and for remote mobile activities).		
[R12]	D 3.3.5 - Report and database provision with all the collected data	HYD335-SPE-001.0	ACT3.3 – Net4Mplastic

2 USER MANUAL

The main functionalities and a detailed list of tasks, to fully operate the WebGIS platform , are described in the next paragraphs. In detail this user manual will cover the following aspects:

- Main page login and main navigation menu;
- Photogallery section;
- Drone – OBU mission data;
- Oceanographic historical data section;
- Plastic concentration index data section;
- Lab data analysis data section;
- Sea sentinel program data section;
- User management section;
- Others.

This user manual is to be intended for normal User level, that has the privilege to visualize the data. The others specific procedures that are necessary for the system management are performed on DB and Script level by the administrators under maintenance procedures, illustrated in the maintenance section.

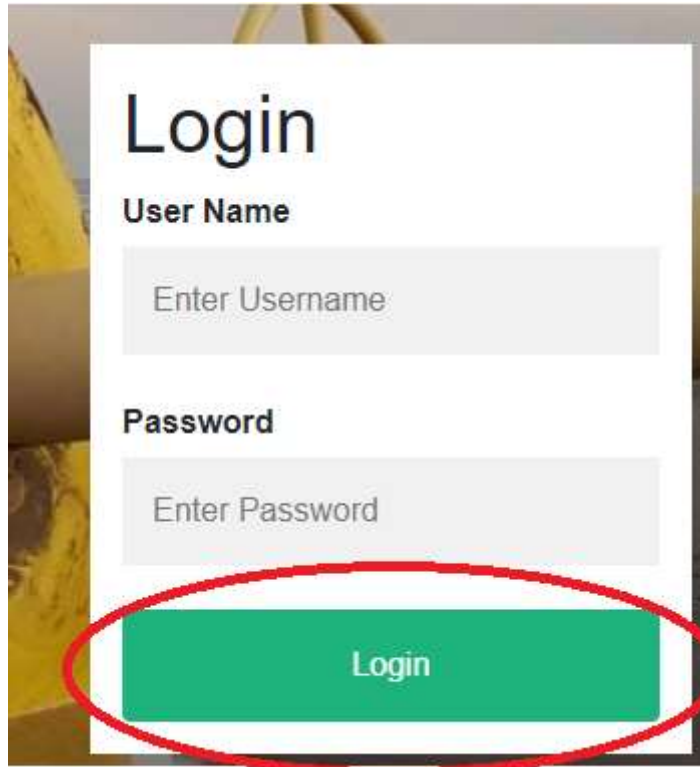
2.1 Main Page – Login

A picture of the main page of the webgis is depicted herebelow, reachable at the address www.net4mplastic.net



Main login page

By inserting the credential receiving upon access request to the system administrators, insert the valid username and password in the field underlined herebelow, followed by a click on the login green button.



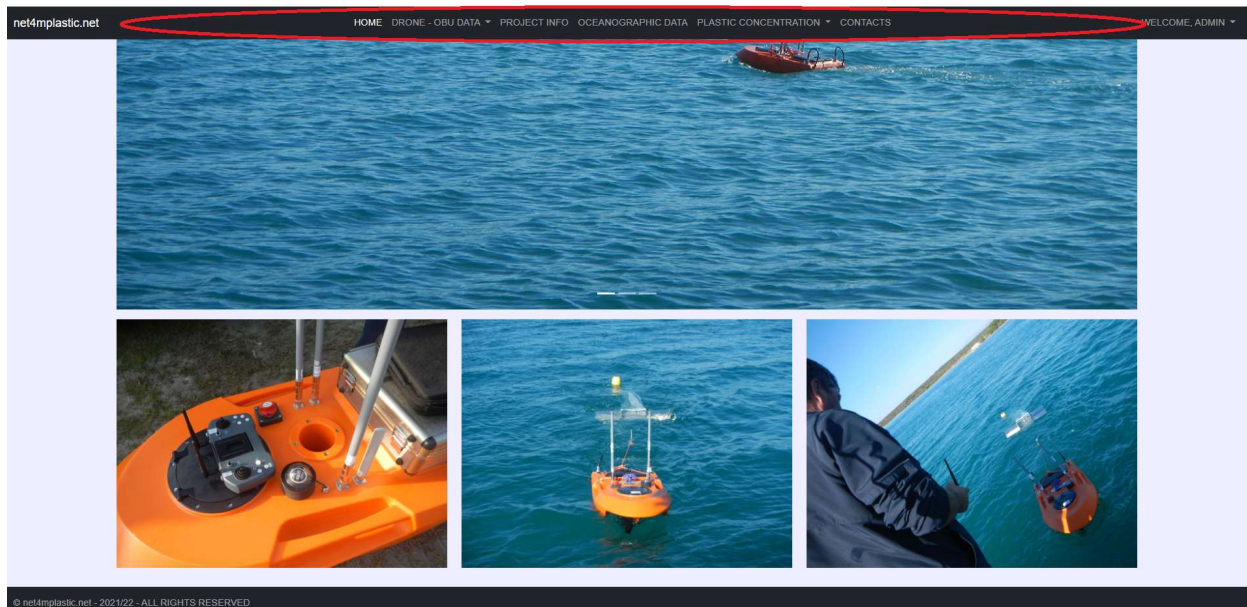
The image shows a login form with the following elements:

- Login** (Title)
- User Name** (Label)
- Enter Username (Input field)
- Password** (Label)
- Enter Password (Input field)
- Login** (Submit button, circled in red)

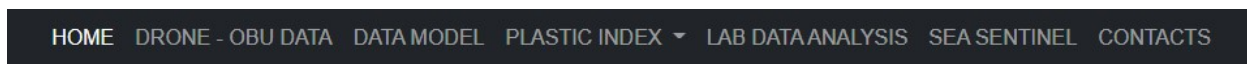
Login detail

The system will then forward the login request to the hosting server and the main WebGIS interface will appear.

The main navigation menu takes part on the upper part of the screen, as highlighted in the picture below.



Main navigation menu location



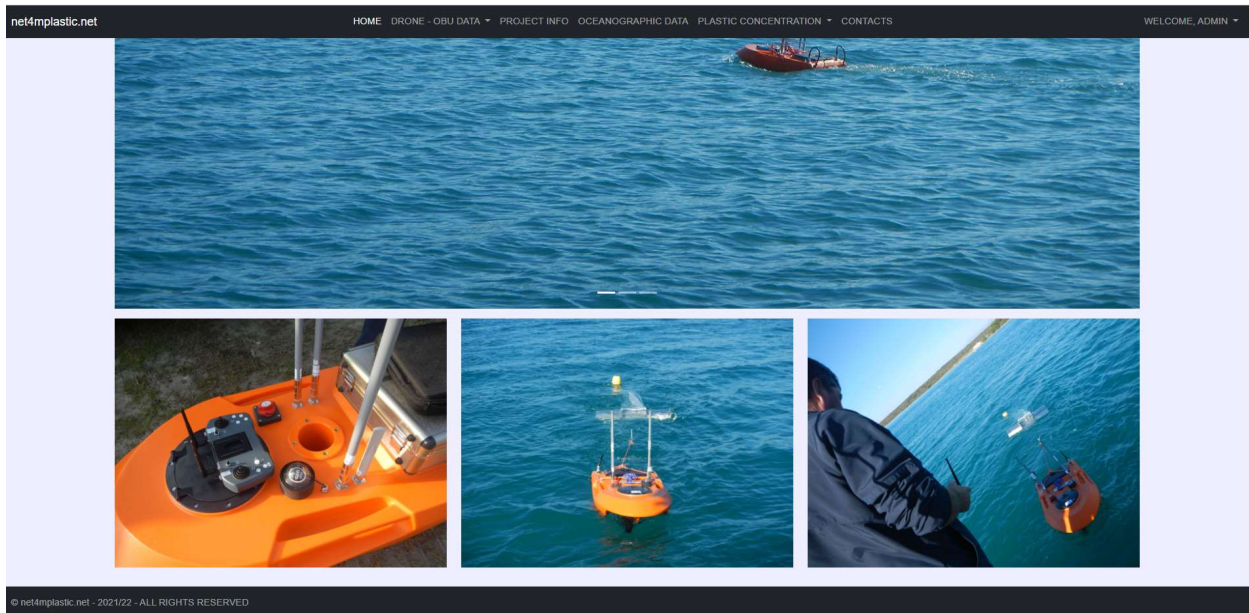
Main navigation menu detail

The main parts of the WebGIS are composed by:

- Drone – OBU data, where all the data available regarding the drone and OBU missions are displayed;
- Oceanographic data model, where all the selected meaningful data coming from the Marche Region oceanographic model are displayed;
- Plastic concentration index, where all the data related to plastic concentration are displayed;
- Alert section, where there are displayed the alert and/or critic conditions for microplastic deposit;
- Lab Data Analysis repository, where all the collected during the mission performed within the project are stored for consult;
- Sea Sentinel, where all the georeferenced pictures related to macroplastic collected by the stakeholders are stored and shown in a GIS environment;
- Contacts section;
- User administration section;

2.2 Photogallery

In the picture below is illustrated the photogallery section. This section, as welcome purpose, shows the pictures collected during the various steps of the project, including short videos and advertising of the project itself.

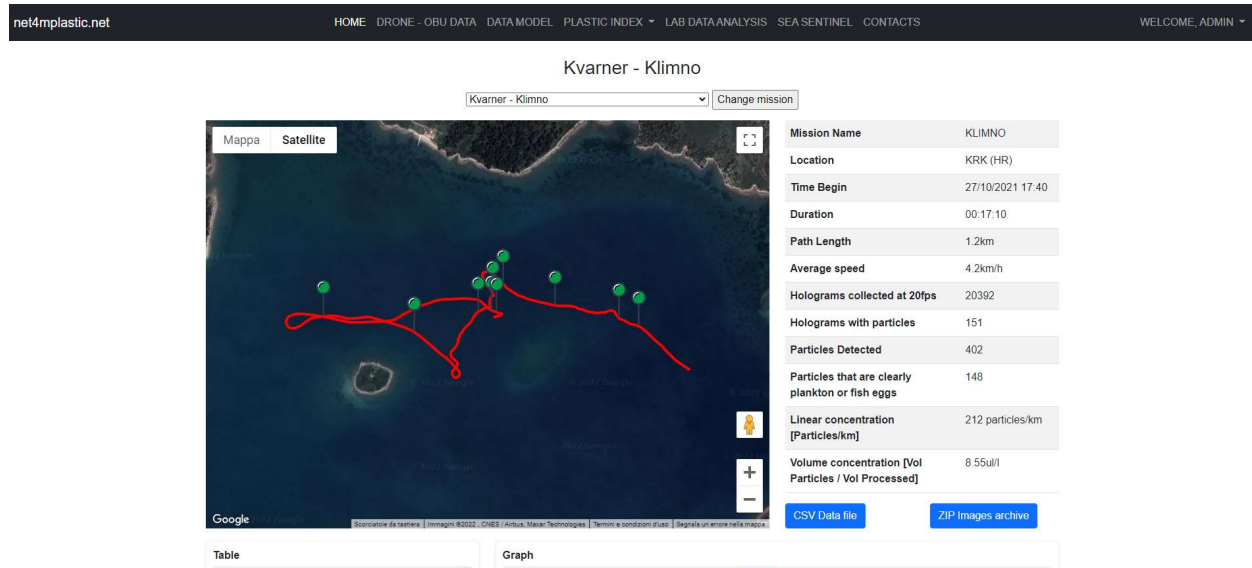


Photogallery section

The gallery can simply be explored by clicking on the navigation buttons “<” and “>” on the side of the thumbnail lower mode, whereas if no button are pressed, the pictures will start to automatically rotate and being shown zoomed in the main screen, in presentation mode.

2.3 Drone – OBU Mission Data

In the picture below is illustrated the Drone – OBU Mission Data page. This section contains the data acquired during the mission performed with the Drone and the OBU during the project.



Kvarner - Klimno

Kvarner - Klimno

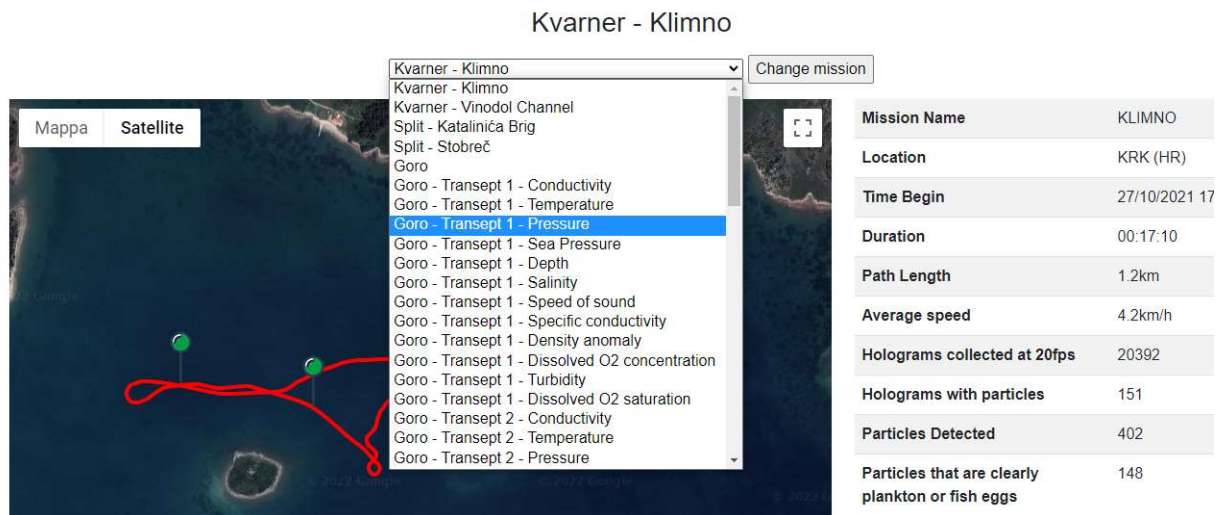
Mission Name	KLIMNO
Location	KRK (HR)
Time Begin	27/10/2021 17:40
Duration	00:17:10
Path Length	1.2km
Average speed	4.2km/h
Holograms collected at 20fps	20392
Holograms with particles	151
Particles Detected	402
Particles that are clearly plankton or fish eggs	148
Linear concentration [Particles/km]	212 particles/km
Volume concentration [Vol Particles / Vol Processed]	8.55u/l

[CSV Data file](#) [ZIP Images archive](#)

Table

Drone – OBU mission page

In the upper part it is possible to select the mission to be shown, by clicking on the desired location in the drop down menu and selecting “Change mission”, as illustrated in the picture below.



Kvarner - Klimno

- Kvarner - Klimno
- Kvarner - Vinodol Channel
- Split - Katalinića Brig
- Split - Stobreč
- Goro
- Goro - Transept 1 - Conductivity
- Goro - Transept 1 - Temperature
- Goro - Transept 1 - Pressure**
- Goro - Transept 1 - Sea Pressure
- Goro - Transept 1 - Depth
- Goro - Transept 1 - Salinity
- Goro - Transept 1 - Speed of sound
- Goro - Transept 1 - Specific conductivity
- Goro - Transept 1 - Density anomaly
- Goro - Transept 1 - Dissolved O2 concentration
- Goro - Transept 1 - Turbidity
- Goro - Transept 1 - Dissolved O2 saturation
- Goro - Transept 2 - Conductivity
- Goro - Transept 2 - Temperature
- Goro - Transept 2 - Pressure

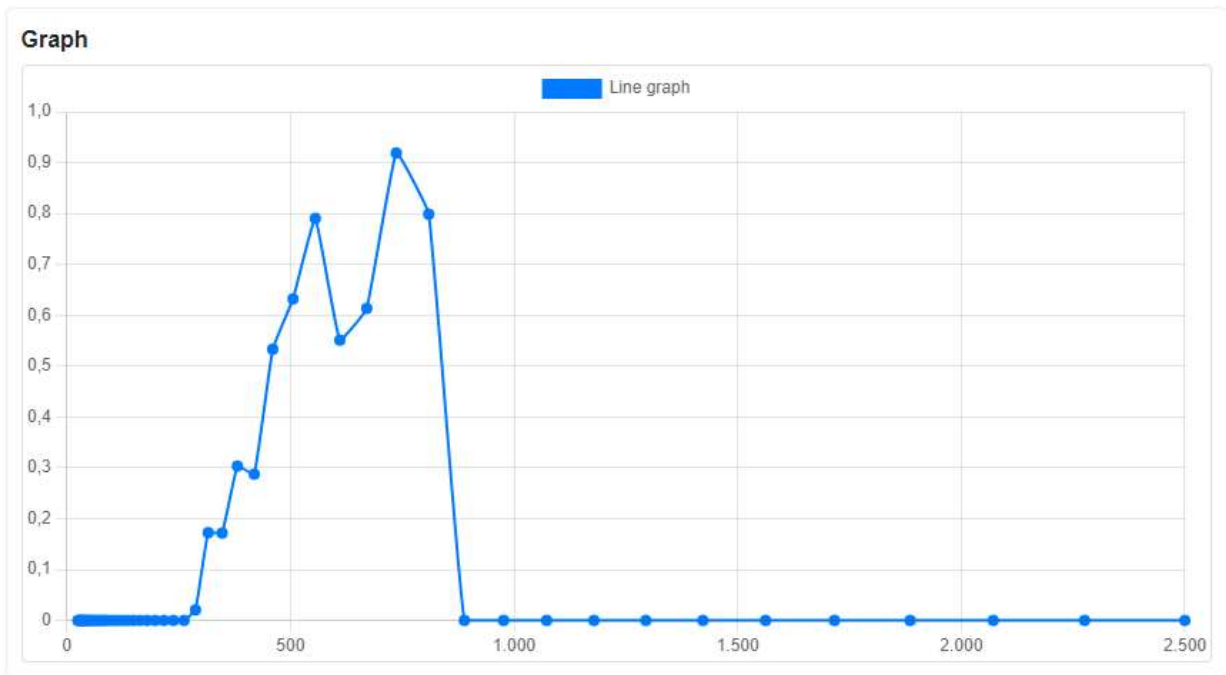
Mission Name	KLIMNO
Location	KRK (HR)
Time Begin	27/10/2021 17:40
Duration	00:17:10
Path Length	1.2km
Average speed	4.2km/h
Holograms collected at 20fps	20392
Holograms with particles	151
Particles Detected	402
Particles that are clearly plankton or fish eggs	148

Mission selection drop down box

The page is then divided in a dynamically created map showing the performed transept, and then the data elaborated by the sensors both in graphical and table mode. On the left side of the map, some brief general information about the performed mission.



Example of transept



Example of plastic concentration graph

Table

Size [um]	Volume concentration [ul/l]
25	0
27.46	0
30.17	0
33.14	0
36.41	0
40	0
43.94	0
48.27	0
53.02	0
58.25	0
63.99	0

Example of plastic concentration data table

The map showing the transept has integrated the following functionalities:

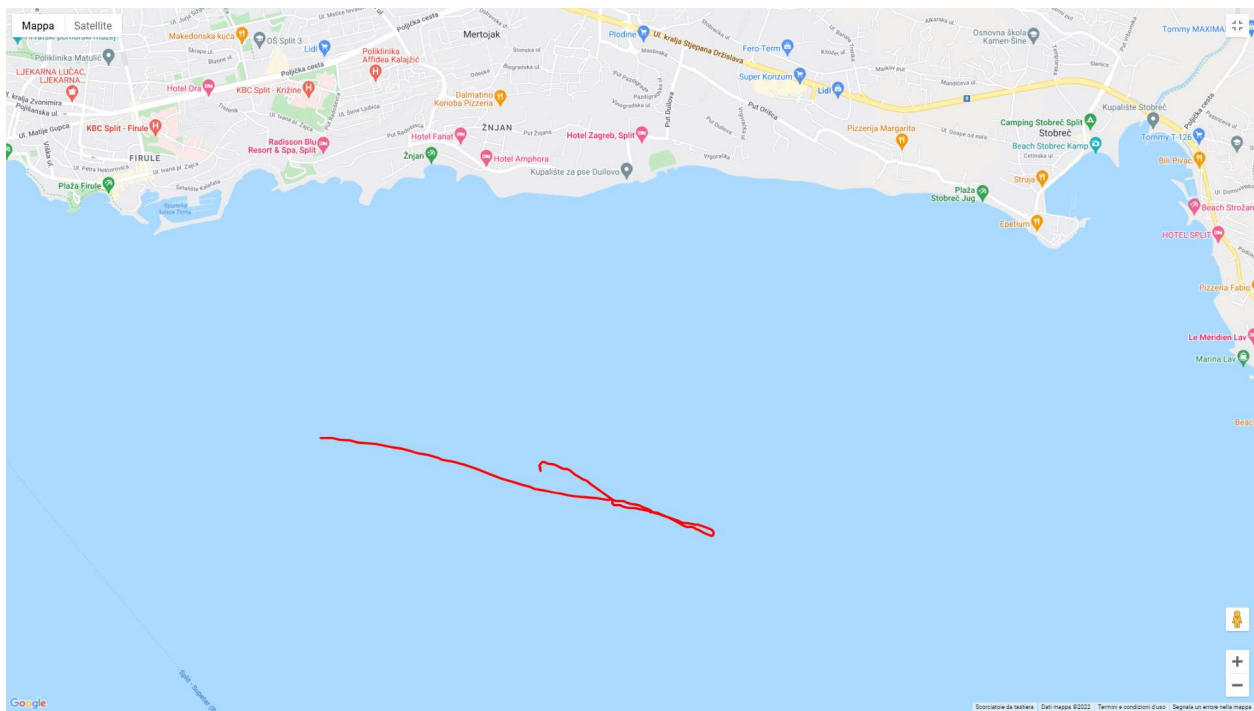
- Waypoint info, showing the coordinates by clicking on the waypoints;
- Satellite / Map mode;
- Zoom in / Zoom out;
- Full screen / Windowed mode.

The map can be then scrolled by clicking on the map and keeping the mouse button pressed, while moving with the mouse itself in the desired directions.

As underlined in the picture below, it is just necessary to press to the related functionality button to have the desired feature executed.



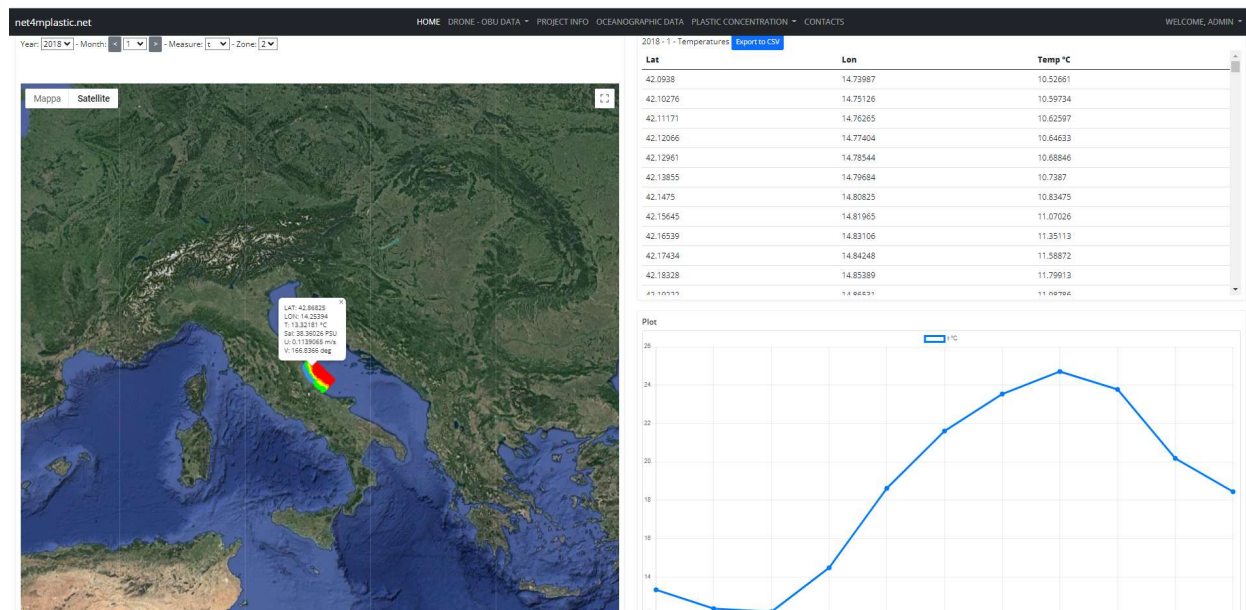
Function buttons location



Fullscreen example, map mode of Split – Stobreč transept

2.4 Oceanographic Data Model Section

In the picture below is illustrated the Oceanographic data model section page. This section contains the extract of oceanographic data such as sea temperature, current speed and direction and salinity utilized by the Marche Region model to determinate the plastic concentrations.



Oceanographic data page

The oceanographic data page is divided in four macro sections:

- Search/query bar section, located in the upper left corner of the page, showing the data selection;
- Maps section, showing the point of interests;
- Table section, showing the requested value in table format;
- Graph section, showing the requested value in XY graph format.

The Search/query bar is detailed in the picture below:

Year: - Month: - Measure: - Zone:

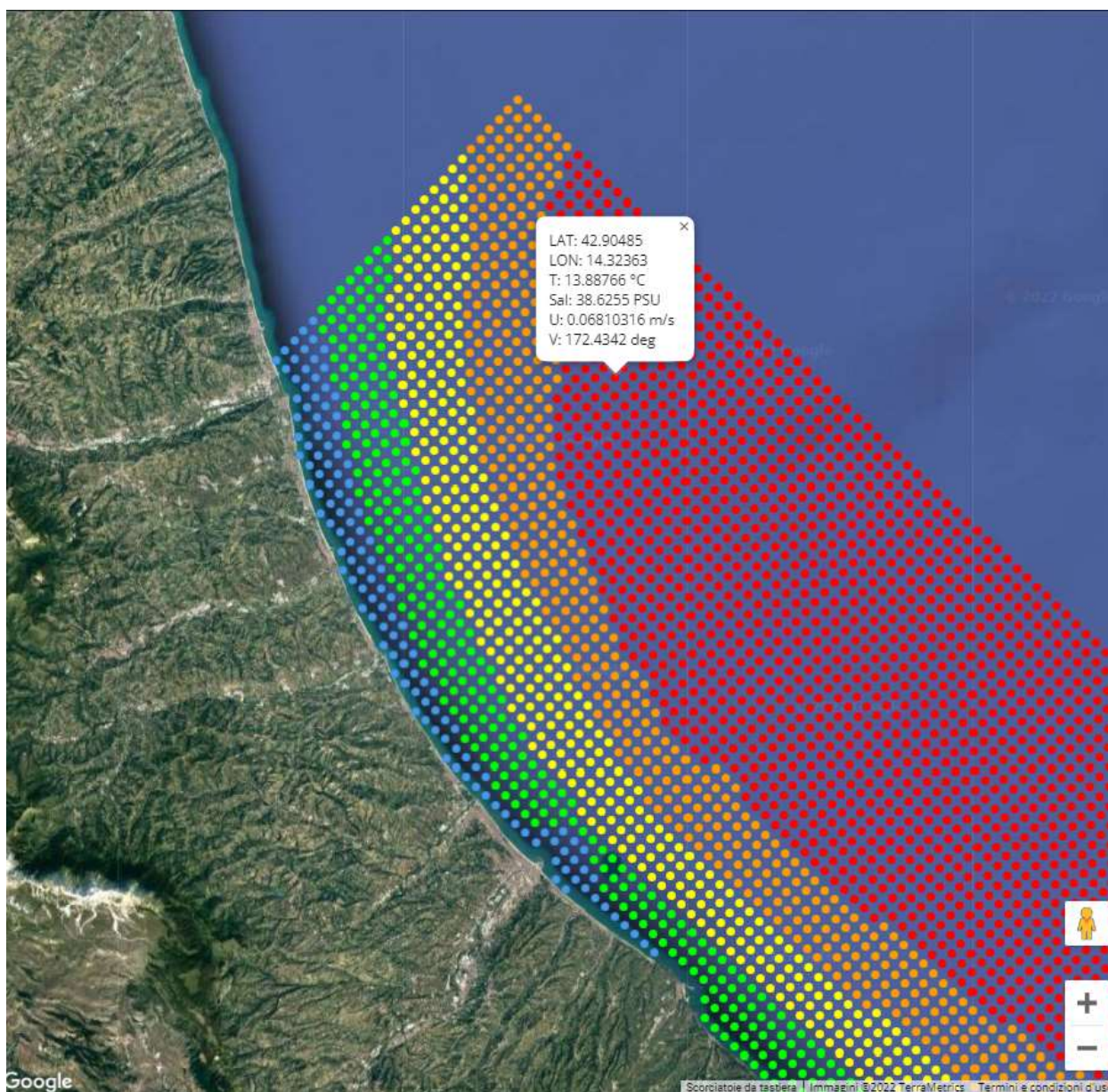
Search/query bar

The user shall select the following parameters to have them displayed, in the related drop down menu:

- Year of data;
- Month of data (1-12 = January to December);
- Measure (t = temperature, sal = salinity, u = current speed, v = current direction);
- Zone (1 to 4, the project zones).

Then the data will be automatically loaded on the Map and Table.
Herebelow is depicted a detail of the Map view.





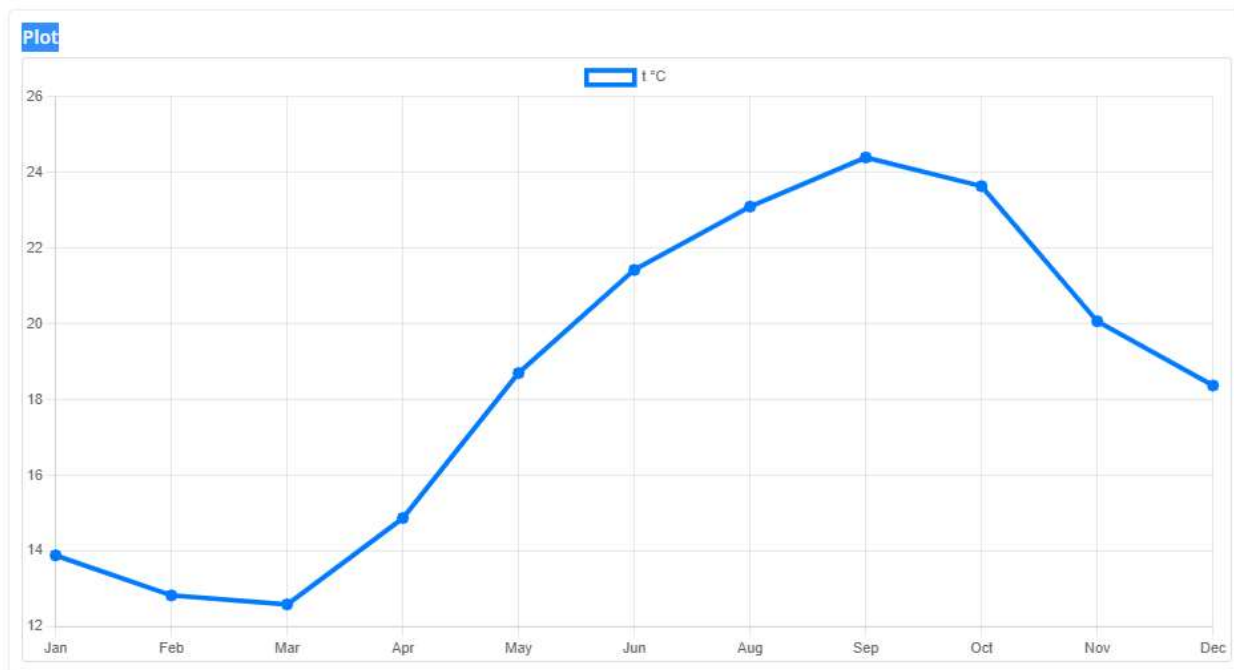
Map view detail - zoomed in and out

Every point in the map correspond to a set of geographic points with their related value of which, the selected one in the Search/query bar, is rasterized by color following usual GIS standards. By clicking on a point in the map, a pop up window will appear, showing all its related values. In the same time, the XY Graph view will be populated with the yearly data related to the selected point.

To choose different points, just click "X" on the map point pop-up window and choose another one, the XY Graph view will automatically refresh with the data coming from the new location.

The Table view shows the set of data of all the geographical points and its related value as per selected in the Search/query bar.

Herebelow are depicted the XY Graph view and the Table view.



XY Graph View for a selected point

2018 - 1 - Temperatures [Export to CSV](#)

Lat	Lon	Temp °C
42.0938	14.73987	10.52661
42.10276	14.75126	10.59734
42.11171	14.76265	10.62597
42.12066	14.77404	10.64633
42.12961	14.78544	10.68846
42.13855	14.79684	10.7387
42.1475	14.80825	10.83475
42.15645	14.81965	11.07026
42.16539	14.83106	11.35113
42.17434	14.84248	11.58872
42.18328	14.85389	11.79913
42.19223	14.86531	11.98766

Table view for all the set of geographical points, in this case 2018 – 1 , equal to January 2018

To export an image of the XY Graph view, it is just necessary to right-click on the XY Graph and choose “Save Image”. The object will dynamically generate a picture file to be saved, to be eventually inserted in documents or report.

To get the selected data in CSV format, it is just necessary to press on the blue “Export to CSV” button located in the upper part of the Table view section. A CSV (comma separated value) will be automatically generated and saved on the desired path pre-set on the web browser.

The generated file has the following name syntax:

export_YYYY_MM_V_Z.csv

Where:

YYYY: Year

M: Month

V: Value: t,sal,u,v

Z: Zone: 1,2,3,4.

Herebelow is shown an extract of a generated CSV exported set of data.

lat,lon,values

44.54152,12.28395,8.022995

44.54431,12.28741,8.033118

44.54709,12.29088,8.041369

44.54988,12.29434,8.051835

44.55267,12.29781,8.057297

44.55546,12.30128,8.059099

44.55824,12.30474,8.062054

44.56103,12.30821,8.063778

44.56382,12.31168,8.072166

44.5666, 12.31515,8.077417

44.56939,12.31862,8.080374

In this case the filename is: *export_2015_2_t_1*, that means year 2015, February, Temperature value, Zone 1.

The map showing the rasterized data has integrated the following functionalities:

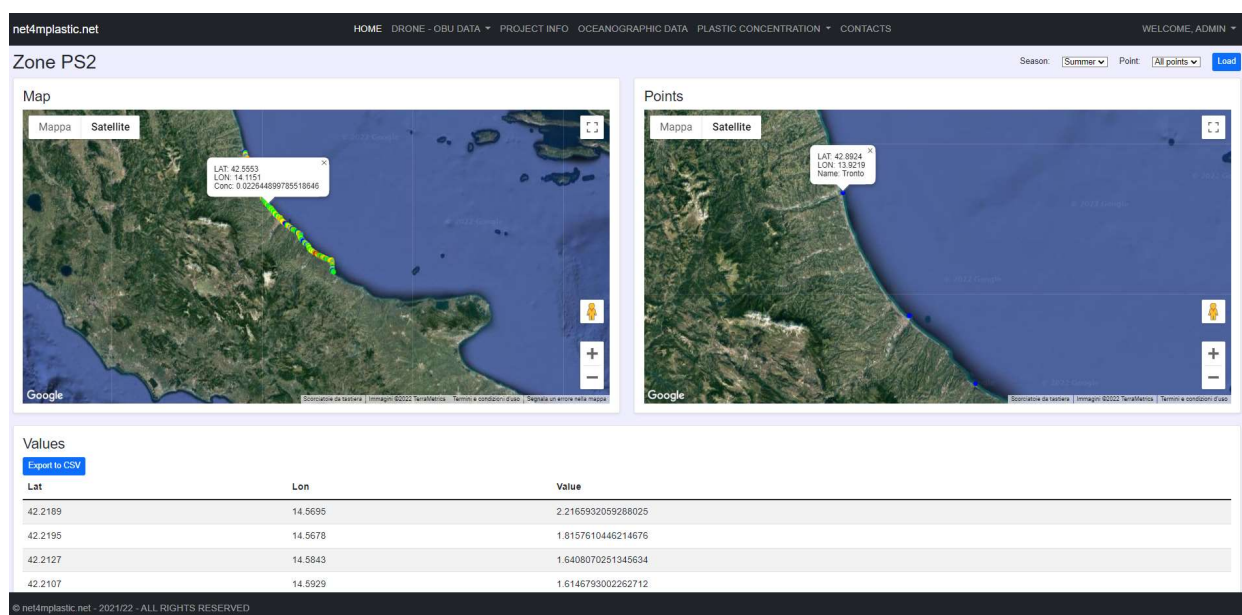
- Geographical points info, showing the set of values for every single point just by clicking on the desired one;
- Satellite / Map mode;
- Zoom in / Zoom out;
- Full screen / Windowed mode.

The map can be then scrolled by clicking on the map and keeping the mouse button pressed, while moving with the mouse itself in the desired directions.

Other functionalities work as per described in the section above.

2.5 Plastic Concentration Index Data Section

In the picture below is illustrated the Plastic concentration index data section. This section contains the extract of the plastic concentration results obtained by running the Marche Region model.



Plastic concentration data page

When choosing the Plastic Concentration menu voice, select the desired zone and then the page depicted above will appear.



Plastic concentration zone selection

The oceanographic data page is divided in four macro sections:

- Search/query bar section, located in the upper right corner of the page, showing the data selection;
- Map section – Plastic deposit results, on the left side of the screen, showing the zone of microplastic deposit distribution coming from their related sources;
- Map section – Sources of plastic, on the right side of the screen, showing the sources of microplastic for the selected zone;
- Table section, showing the percentage values of concentration for the selected zone.

The Search/query bar is detailed in the picture below:

Season: Point:

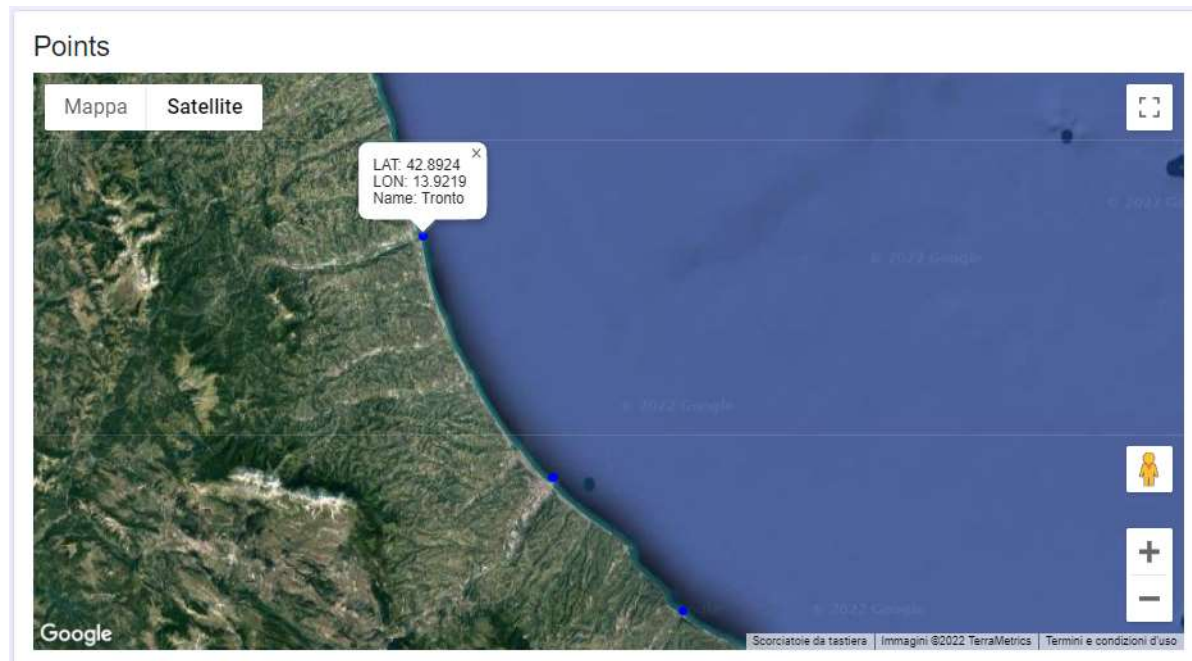
Search/query bar

The user shall select the following parameters to have them displayed, in the related drop down menu:

- Season: Season of the year of which represent the data (summer, autumn, winter, spring);
- Points: Sources of the microplastic. By selecting “All points”, the sum of the effect of all the sources will be considered and shown in the maps and in the table data section. By selecting a single source, only the contribution of that source will be considered and shown in the maps and in the table data section.

Then, after pressing the blue “Load” button, the data will be loaded on the Maps and Table.

Herebelow is depicted a detail of the Maps view – Results and Sources.



Map



Map view detail – Source points and concentration distribution

Every point in the Map – Deposit results, correspond to a set of geographic points with their related percentage of plastic concentration value. It is rasterized by color following usual GIS standards. By clicking on a point in the map, a pop up window will appear, showing all its related values.

Every point in the Map – Sources, correspond to a well-known source of microplastic. Sources will appear all blue in case of “All points” selection, whileas they will appear all blue apart one red in case of single source selection, and the red one will represent the chosen one.

The Table view shows the set of data of all the geographical points and its related value as per selected in the Search/query bar.

Herebelow is depicted Table view.

Lat	Lon	Value
42.4691	14.2325	0.4338130056858063
42.3565	14.4155	0.40809300541877747
42.4327	14.2718	0.39780500531196594
42.3571	14.4138	0.37208500504493713
42.4637	14.233	0.34808000922203064
42.4622	14.2339	0.3360770046710968
42.4073	14.3151	0.3343620002269745
42.3843	14.3614	0.3034979999065399
42.3578	14.4121	0.28292199969291687
42.4322	14.2735	0.2743479907512665
42.4673	14.2327	0.27263399958610535
42.356	14.4172	0.2674099995326996
42.3761	14.3762	0.25548699498176575
42.4496	14.2465	0.25377199053764343
42.3846	14.3596	0.24519899487495422
42.4333	14.2701	0.24005499482154846
42.4707	14.2318	0.2349109947681427
42.397	14.3358	0.23148199915885925
42.3551	14.4225	0.21947899460792542

Table view for all the set of geographical points of the Zone 1 - Summer

To get the selected data in CSV format, it is just necessary to press on the blue “Export to CSV” button located in the upper part of the Table view section. A CSV (comma separated value) will be automatically generated and saved on the desired path pre-set on the web browser.

The generated file has the following name syntax:

Concentration_PSX_SEASON.csv

Where:

PSX: PS1,PS2,PS3,PS4 are the zones

Season: Summer, Autumn,Winter,Spring are the season.

Herebelow is shown an extract of a generated CSV exported set of data.

```
lat,lon,values
44.8224,12.4109,3.23072822537506
44.8272,12.4258,2.3354416796937585
44.8237,12.4121,2.2166629303828813
44.8261,12.4244,2.2105296783847734
44.828,12.4274,2.1913089986192062
44.8208,12.4112,2.166606961574871
45.1985,12.3054,2.13108114930219
44.8764,12.4857,2.000582415377721
45.2002,12.3048,1.9623088836087845
45.1936,12.3076,1.9521863013505936
```

In this case the filename is: Concentration_PS1_Summer, that means zone 1, Summer season.

The map showing the rasterized data has integrated the following functionalities:

- Geographical points info, showing the set of values for every single point just by clicking on the desired one;
- Satellite / Map mode;
- Zoom in / Zoom out;
- Full screen / Windowed mode.

The map can be then scrolled by clicking on the map and keeping the mouse button pressed, while moving with the mouse itself in the desired directions.

Others functionalities work as per described in the section above.

2.6 User Management Section

In the picture below is illustrated the User Management Section. This section is about modifying user levels and user info. It is located under the right side of the menu, on the voice “Welcome, USER” and accessible only to the administrator of the WebGIS

[Add New Permission](#)

Show entries Search:

S.No	Role	Module	View	Add	Edit	Delete	Special	Actions
1	Super Admin	Permissions	✓	✓	✓	✓	✓	Edit Delete
2	Super Admin	Dashboard	✓	✓	✓	✓	✓	Edit Delete
3	Super Admin	Users	✓	✓	✓	✓	✓	Edit Delete
4	Super Admin	Roles	✓	✓	✓	✓	✓	Edit Delete
5	Super Admin	Settings	✓	✓	✓	✓	✓	Edit Delete
6	Super Admin	Modules	✓	✓	✓	✓	✓	Edit Delete

Showing 1 to 6 of 6 entries
[Previous](#)
[1](#)
[Next](#)

Dashboard | **User List**

User List

Add

ID	Name	Gender	Email	Mobile	Role		

User management section view

User levels are:

Level 1: Admin, which have the full operativity on the WebGIS;

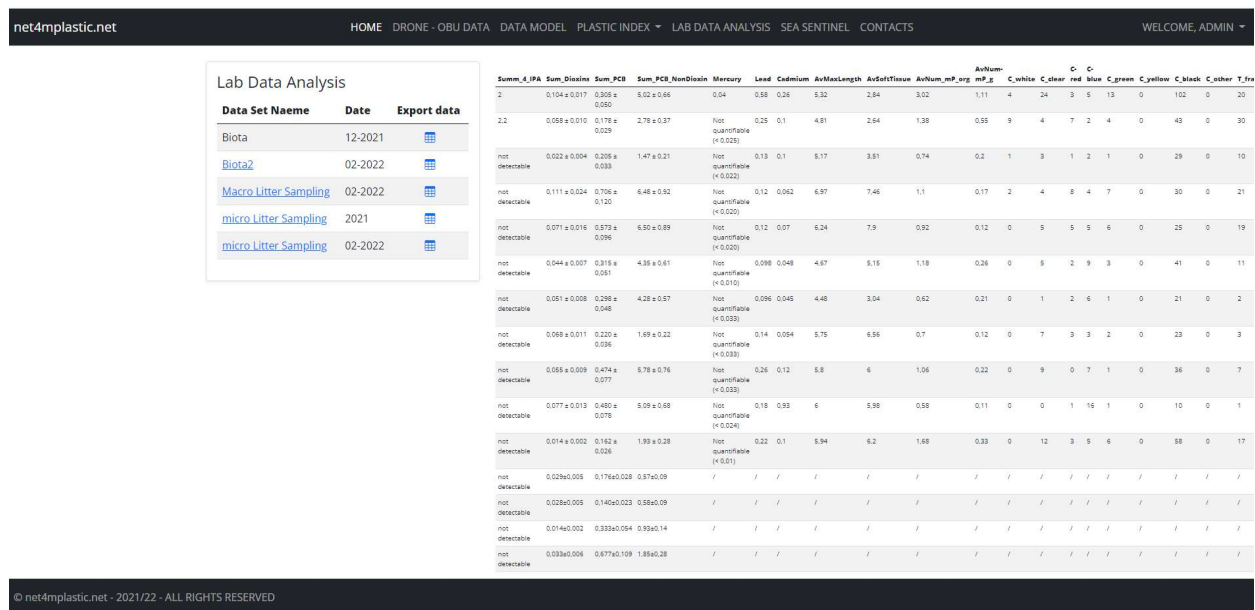
Level 2: Technician, which can submit data to be loaded;

Level 3: User, which can view and operate the WebGIS.

To operate on a user as admin, it is just necessary to modify the desired voice and save the settings. Other operations are performed at DB level by the administrators during the maintenance procedures.

2.7 Lab Data Analysis Section

In the picture below is illustrated the Lab data analysis section page. This section is a repository of the laboratory data analysis performed and loaded by the partner during the lifespan of the project.



Summ_PA	Sum_Dioxins	Sum_PCB	Sum_PCB_NonDioxin	Mercury	Lead	Cadmium	AshesLength	AshesTissue	Ashum_MP_arg	Ashum_MP_g	C_White	C_Clear	red	blue	C_green	C_yellow	C_black	C_other	T_fra
2	0.104 ± 0.017	0.362 ± 0.050	0.02 ± 0.04	0.04	0.58	0.26	5.32	2.84	3.02	1.11	4	34	3	5	13	0	102	0	20
2.2	0.058 ± 0.010	0.178 ± 0.029	2.78 ± 0.37	not quantifiable (< 0.020)	0.25	0.1	4.81	2.64	1.38	0.55	9	4	7	2	4	0	43	0	30
not detectable	0.022 ± 0.004	0.205 ± 0.033	1.47 ± 0.21	not quantifiable (< 0.022)	0.13	0.1	5.17	3.51	0.74	0.2	1	3	1	2	1	0	29	0	10
not detectable	0.111 ± 0.024	0.702 ± 0.120	6.48 ± 0.92	not quantifiable (< 0.020)	0.12	0.062	6.97	7.46	1.1	0.17	2	4	8	4	7	0	30	0	21
not detectable	0.071 ± 0.018	0.573 ± 0.096	6.50 ± 0.89	not quantifiable (< 0.020)	0.12	0.07	6.24	7.9	0.92	0.12	0	5	5	5	6	0	25	0	19
not detectable	0.044 ± 0.007	0.315 ± 0.051	4.35 ± 0.61	not quantifiable (< 0.010)	0.098	0.048	4.67	5.15	1.18	0.26	0	5	2	9	3	0	41	0	11
not detectable	0.051 ± 0.008	0.298 ± 0.048	4.25 ± 0.57	not quantifiable (< 0.033)	0.096	0.045	4.48	3.04	0.62	0.21	0	1	2	6	1	0	21	0	2
not detectable	0.068 ± 0.011	0.220 ± 0.036	1.59 ± 0.22	not quantifiable (< 0.033)	0.14	0.094	5.75	6.55	0.7	0.12	0	7	3	3	2	0	23	0	3
not detectable	0.055 ± 0.009	0.274 ± 0.077	5.78 ± 0.76	not quantifiable (< 0.033)	0.26	0.12	5.8	6	1.06	0.22	0	9	0	7	1	0	36	0	7
not detectable	0.077 ± 0.013	0.480 ± 0.078	5.09 ± 0.68	not quantifiable (< 0.024)	0.18	0.93	6	5.98	0.58	0.11	0	0	1	16	1	0	10	0	1
not detectable	0.014 ± 0.002	0.162 ± 0.026	1.99 ± 0.28	not quantifiable (< 0.01)	0.22	0.1	5.94	6.2	1.68	0.33	0	12	3	5	6	0	58	0	17
not detectable	0.029 ± 0.005	0.176 ± 0.028	0.57 ± 0.09	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
not detectable	0.028 ± 0.005	0.140 ± 0.023	0.58 ± 0.09	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
not detectable	0.014 ± 0.002	0.333 ± 0.054	0.93 ± 0.14	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
not detectable	0.033 ± 0.006	0.877 ± 0.109	1.85 ± 0.28	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/

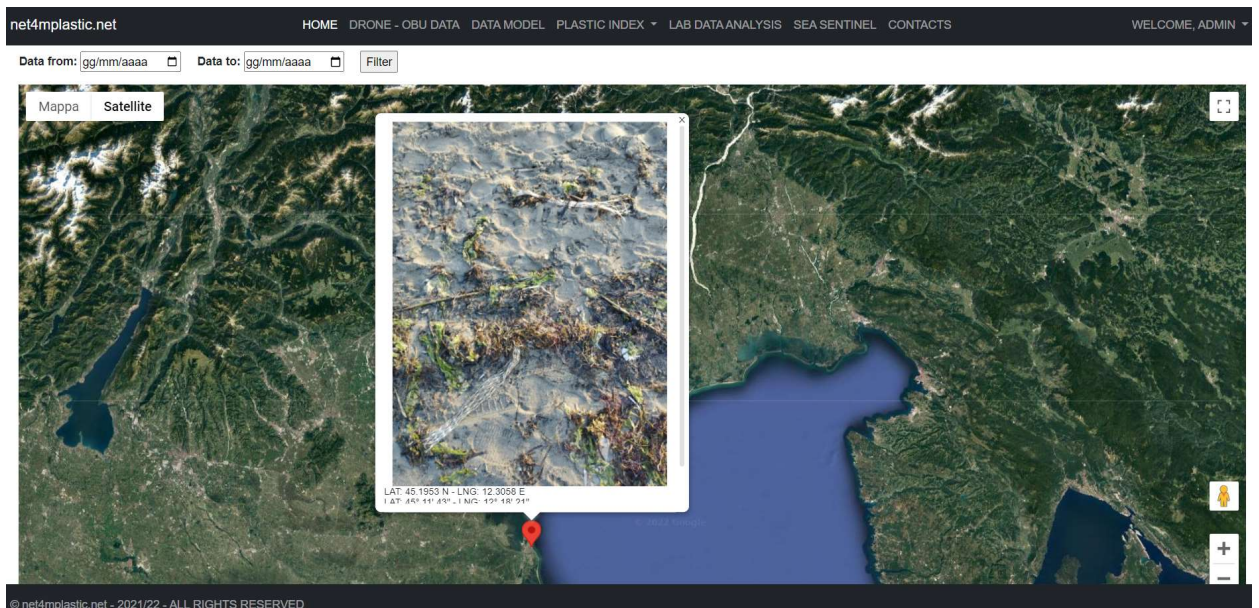
Lab data analysis section

The lab data analysis section is divided in two sections

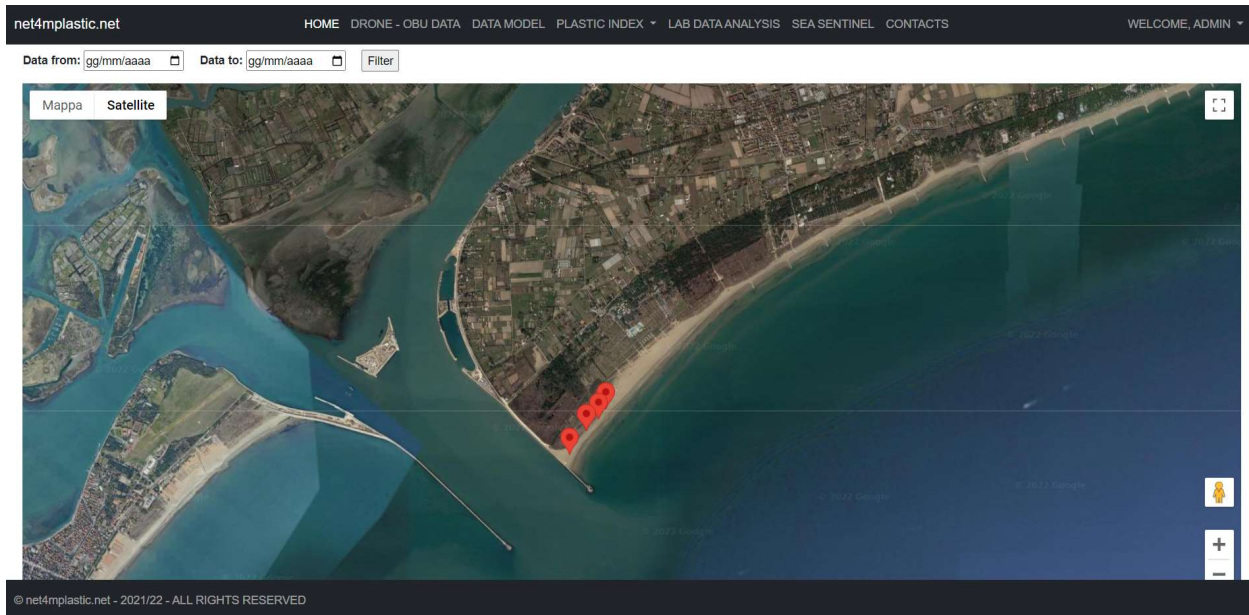
- Analysis list, located in the left side of the page, showing the selectable and exportable data analysis performed and loaded on the platform
- Table section, located on the right side of the page, showing the requested analysis value in table format;

2.8 Sea Sentinel Section

Alongside the development of the microplastic WebGIS, it has also been implemented the sub-project “Sea sentinel”, where fishermen and normal user can send their acquired georeferenced pictures to the system, to then be plotted on a map, to keep trace of the macroplastic detection at sea. A “sea-sentinel” sub menu has been implemented in full screen mode showing the points of interest in the same way as described above, including the picture of the detected macroplastic, as shown in the picture below.



Sea sentinel macroplastic point detail



Sea sentinel macroplastic points

The amount of points to be spreaded on the map can be filtered by date by the menu located on the upper left side of the screen, selecting:

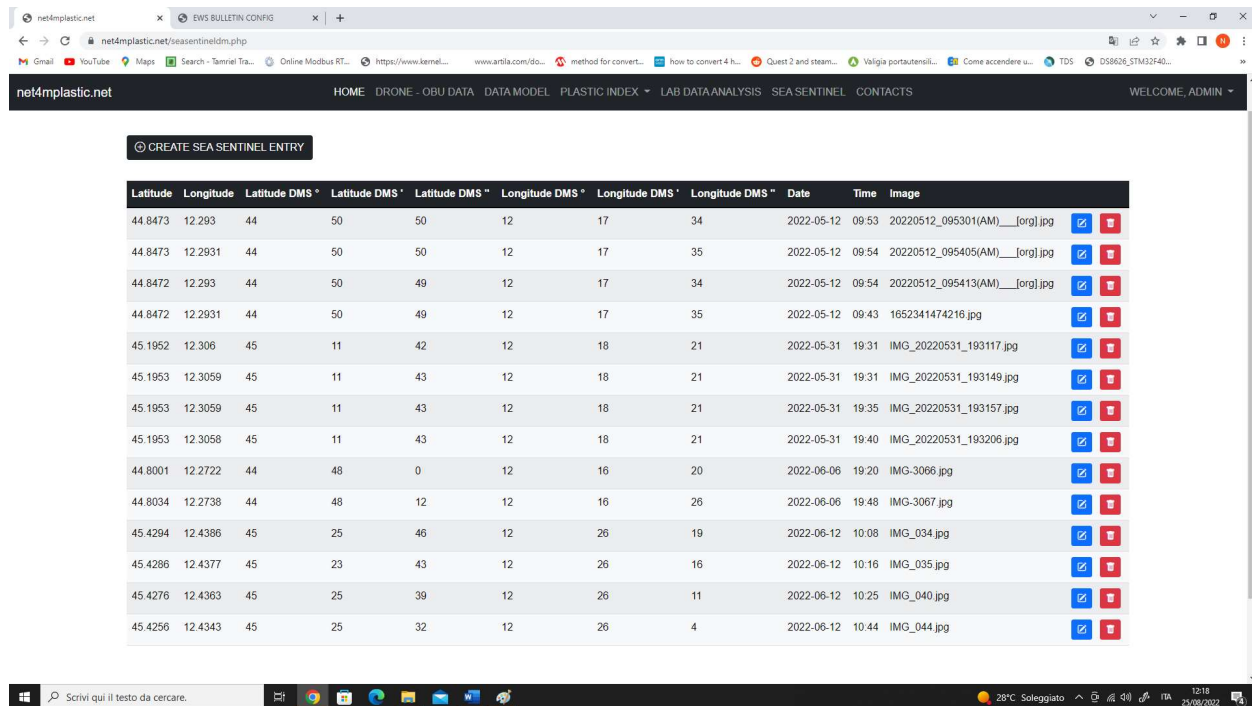
- Date “from”;
- Date “to”;
- Finalize by pressing the “Filter” button.

A detail of the filtering criteria section is illustrated in the picture below.

Data from: Data to:

Sea sentinel filtering menu

Pictures can be added manually by the administrator by the administrator menu, under the voice “S.Sentinel Data Entry”. Herebelow is depicted the data entry format of the sea sentinel program.



Sea sentinel data management

In this section it is possible to:

- Add new georeferenced pictures, that will be dynamically stored in the project DBMS;
- Modify an existing picture;
- Delete an existing picture.

By clicking in the top left corner, on the black button “Create Sea Sentinel Entry”, the following data entry sub-menu will appear.

HOME DRONE - OBU DATA DATA MODEL PLASTIC INDEX LAB DATA ANALYSIS SEA SENTINEL CONTACT

Create Sea Sentinel Entry

S °	Latitude DMS '	Latitude DMS "	Longitude DMS °	Longitude DMS '	Longitude DMS "	Date	Time	In
50	50					2022-05-12	09:53	2
50	50					2022-05-12	09:54	2
50	49					2022-05-12	09:54	2
50	49					2022-05-12	09:43	1
11	42					2022-05-31	19:31	11
11	43					2022-05-31	19:31	11
11	43					2022-05-31	19:35	11
11	43					2022-05-31	19:40	11
48	0					2022-06-06	19:20	11
48	12					2022-06-06	19:48	11
25	46					2022-06-12	10:08	11
23	43					2022-06-12	10:16	11
25	39	12	26	11		2022-06-12	10:25	11
25	32	12	26	4		2022-06-12	10:44	11

Latitude

Longitude

Latitude DMS °

Latitude DMS '

Latitude DMS "

Longitude DMS °

Longitude DMS '

Longitude DMS "

gg/mm/aaaa

--

Scegli file Nessun file selezionato

CANCEL SAVE

Sea sentinel sub-menu data entry





The fields to be populated are:

- Latitude (for reference only);
- Longitude (for reference only);
- Latitude DMS °;
- Latitude DMS ';
- Latitude DMS ";
- Longitude DMS °;
- Longitude DMS ';
- Longitude DMS ";
- Date;

- Hour;
- Picture to be uploaded (in JPG format).

By clicking on the save button, the picture and the related georeferenced information will be permanently stored on the project database and plotted under the sea sentinel section.

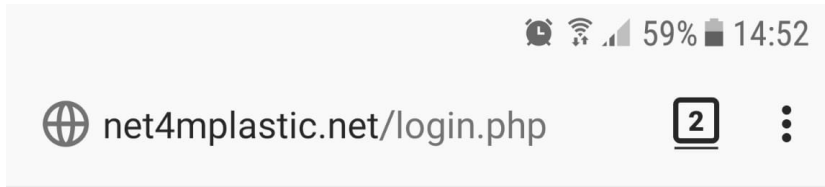
To modify a picture data subset or to delete a whole picture data entry, it is just necessary to press respectively on the Blue modify button close to the related entry to be modified or on the Red Trashbin delete button close to the related entry. A detail is illustrated in the picture below.

Latitude	Longitude	Latitude DMS °	Latitude DMS '	Latitude DMS ''	Longitude DMS °	Longitude DMS '	Longitude DMS ''	Date	Time	Image		
44.8473	12.293	44	50	50	12	17	34	2022-05-12	09:53	20220512_095301(AM)__[org].jpg		
44.8473	12.2931	44	50	50	12	17	35	2022-05-12	09:54	20220512_095405(AM)__[org].jpg		

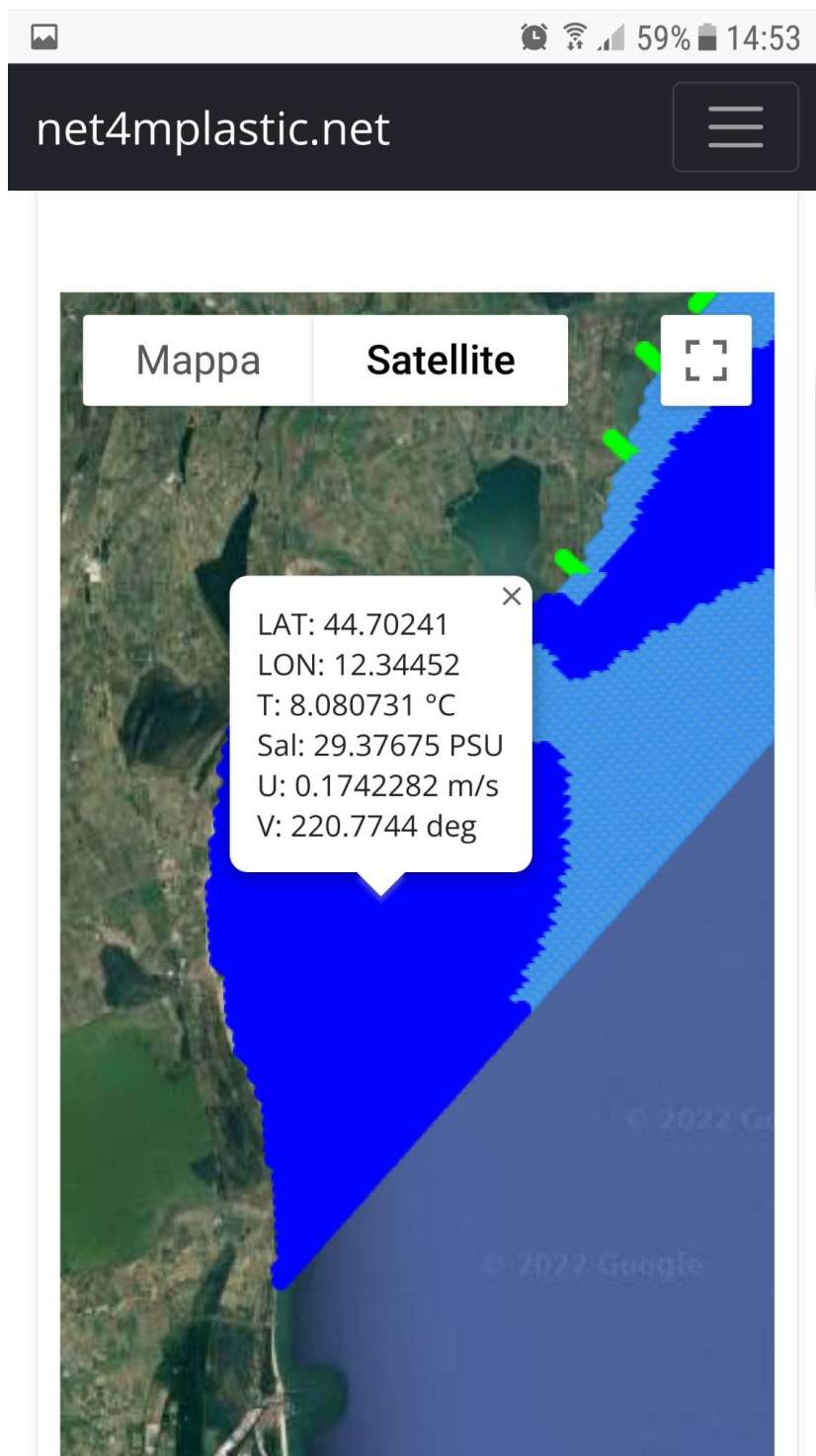
Sea sentinel modify/delete detail

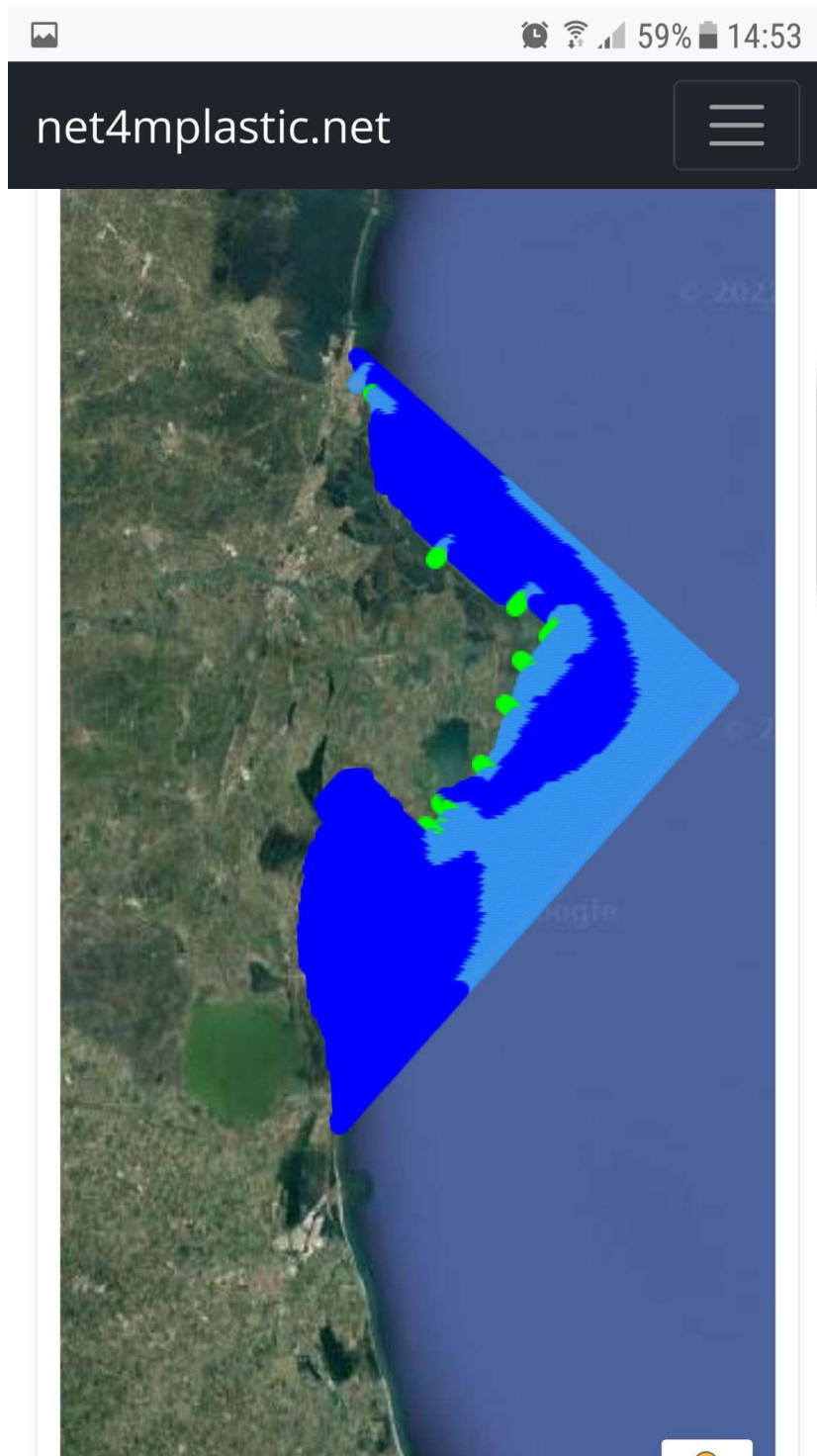
2.9 Others

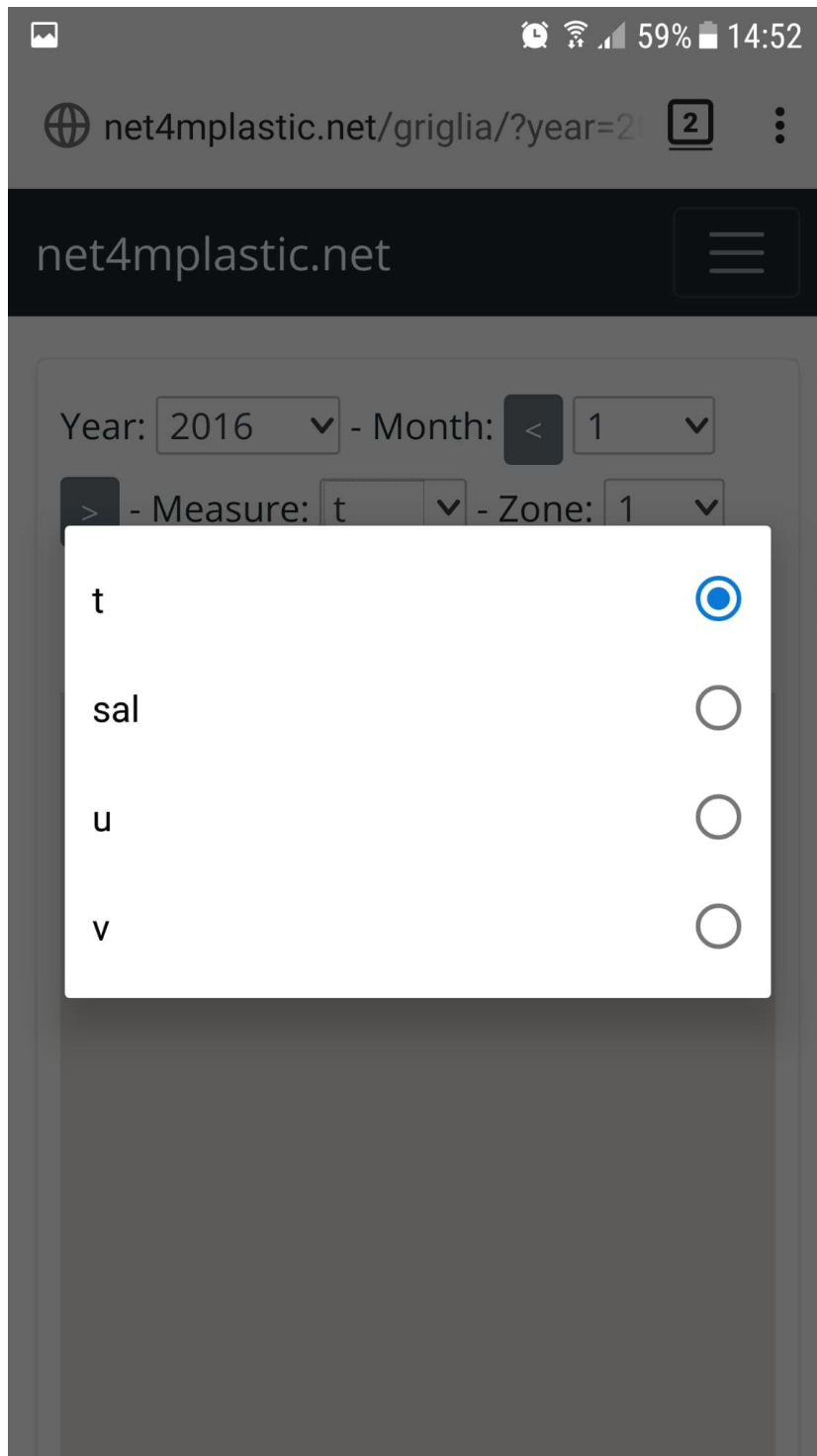
Software is scaled to be portable also on Android/MacOS tablet/smartphones. The functionalities are exactly the same and the system is autoadaptive due to the CSS formatting standard of the WebGIS interface. Herebelow are depicted, as example, some screenshot taken from an Android smartphone, showing the functionalities described above.

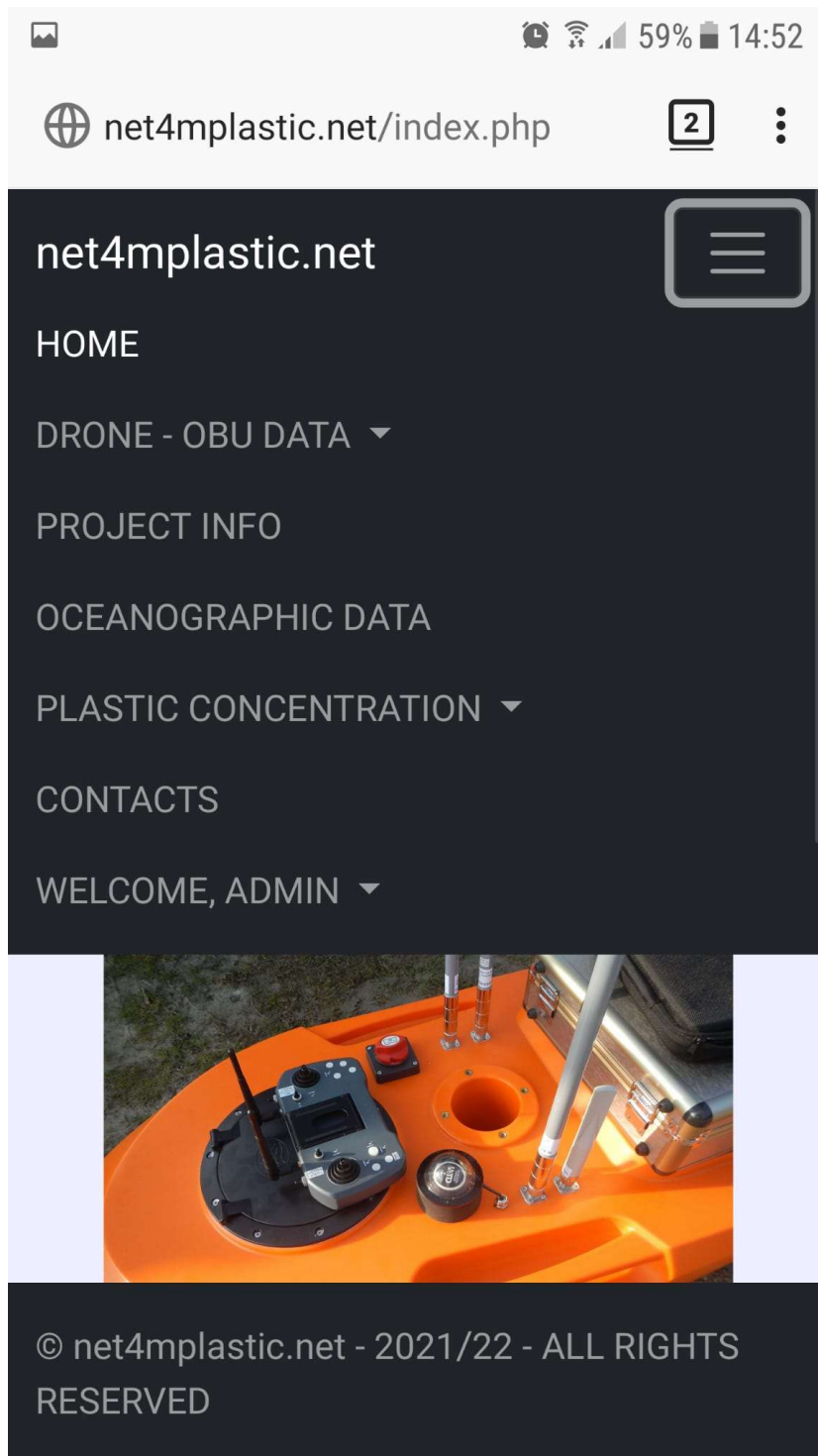


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3 MAINTENANCE MANUAL

In the following paragraphs is illustrated the minimal maintenance program and its related maintenance procedures to be performed periodically.

3.1 Maintenance Program

Herebelow is described the maintenance program for the software platform subsystems.

MAINTENANCE TASK	6 Months	1 Year	2 Years
DB100 – DB Maintenance			
DB101 – Check for DB Health	●		
DB102 – DB Backup		●	
DB103 – DB Purging and Cleaning			●
WG200 – WebGIS Interface Maintenance			
WG201 – Check for WebGIS Health	●		
WG202 – WebGIS Activity	●		
WG203 – User Purge			●

3.2 Maintenance Procedure

This section deals with the maintenance procedures related to the different subsystems constituting the WebGIS. For each subsystem the instructions for a correct maintenance are provided in order to keep the system operative with the expected performances.

For each maintenance task the following details are provided:

- a) Placing of the part or sub system to be serviced;
- b) Related drawings or equivalent graphical representation;
- c) Required resources for the service;
- d) Expected minimal performances;
- e) Possible Failures;
- f) End User Maintenance Interventions;
- g) Specialist User Interventions.

<p>DB100 – DB Maintenance</p> <p>DB101 – Check for DB Health</p> <p>DB102 – DB Backup</p> <p>DB103 – DB Purging and Cleaning</p>	
<i>Placing</i>	Online SQL Server
<i>Drawings</i>	-
<i>Minimal Performance</i>	-
<i>Possible Failures or Anomalous Conditions</i>	DB Slow in responding, Data not showing, Wrong data shown, Data Mismatch, DB Failure
<i>Required Resources</i>	Internet connection SQL Server administrator credentials
<i>End User Interventions</i>	--
<i>Specialist Intervention</i>	<p>DB101 – Check for DB Health</p> <p>Use SQL Management system tool to check the database integrity. In case of heavy failure, rollback a previous backup</p> <p>DB102 – DB Backup</p>

	<p>Use SQL Management system tool to perform a periodic backup of the DB data and store it on an external drive.</p> <p>DB103 – DB Purging and Cleaning</p> <p>Check the EVENT LOG table for anomalies and eventually purge the table to don't overexceed the limits.</p> <p>Check the presence of duplicated data and manually delete the data set.</p>
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<p>WG200 – WebGIS Interface Maintenance</p> <p>WG201 – WebGIS Health</p> <p>WG202 – WebGIS Activity</p> <p>WG203 – User Purge</p>	
<i>Placing</i>	Online WebGIS Platform
<i>Drawings</i>	-
<i>Minimal Performance</i>	-
<i>Possible Failures or Anomalous Conditions</i>	WebGIS not showing, WebGIS website returning 404 Error, WebGIS slow in response.
<i>Required Resources</i>	Internet connection Hosting platform administration credential
<i>End User Interventions</i>	<p>WG202 – WebGIS Activity</p> <p>Check the user traffic / bandwidth in the administration credential. In case of excess of bandwidth, extend the account and ask the provider for more bandwidth.</p> <p>WG203 – User Purge</p> <p>Thru the administration panel – user management section, purge the non active users and/or revoke accounts in case of bandwidth exceeded limits and the lack of possibility to extend the bandwidth with the provider</p>
<i>Specialist Intervention</i>	WG201 – Check for WebGIS Health

	<p>Using the hosting site health check functionalities, check the system integrity and the script file integrity. In case of malfunction, replace with the original code backup copy</p>
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