



HarmoNIA



Harmonization and Networking for contaminant assessment
in the Ionian and Adriatic Seas

Deliverable M5.2 - HarmoNIA Final Scientific Report

Work Package M - Management

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1. Background

The overall increase in maritime transport, coastal urbanization and the foreseen increase in offshore oil and gas extraction pose serious risks of pollution from hazardous substances for several coastal states in the whole Mediterranean Sea, and particularly in the Adriatic - Ionian region. Countries sharing a marine region or sub-region should adopt a common approach for environmental monitoring, good environmental status definition and assessment.

In the Adriatic - Ionian marine sub-regions, the level of coherence and consistency of several EU and regional environmental policies is low, and in particular the assessment of contamination from hazardous substances, needs a common implementation. Availability of harmonized and validated data sets is a prerequisite for the proper understanding and management of the marine environment.

HarmoNIA builds on the long - term EU initiative EMODnet for the management and supply of fragmented marine data, and further consolidates the transnational network of institutions involved in marine research and in Marine Strategy Framework Directive (MSFD) and Barcelona Convention UNEP/MAP protocols implementation.

HarmoNIA contributes to: Marine Strategy Framework Directive, Maritime Spatial Planning Directive, EUSAIR Strategy (EU Strategy for the Adriatic and Ionian Region), Protocols of the Barcelona Convention against pollution and, lastly, to 2021-2030 UN Decade Goals of Ocean Science for Sustainable Development.



2. HarmoNIA challenges in synthesis:

- ❖ The ADRION region is a hot spot of biodiversity and is of key environmental importance
- ❖ The region is crowded with human activities, most relying on Good Environmental Status (GES *sensu* MSFD), but at the same time threatening GES
- ❖ Marine pollution is a critical issue
- ❖ There is an urgent need for harmonized monitoring protocols for reliable assessment of Good Environmental Status and for accessible monitoring data
- ❖ Management of possible polluting activities, such as offshore activities, requires a common approach for Environmental Impact Assessment, monitoring and decommissioning



- ❖ A common strategy and information framework to assess contaminant dispersion risk in cross-border and transnational areas is highly needed

3. Objectives

- ❖ Address the heterogeneity in methodological approaches (sampling -> analysis -> assessment) for pollution monitoring, assessment and management, and provide methodological proposals to improve harmonization and, at the end, data comparability
- ❖ Overcome the fragmentation in data and information availability on contaminants and facilitate access to marine environmental data and information
- ❖ Propose an approach for marine pollution dispersion risk assessment

4. Approach

- ❖ Establish an Adriatic - Ionian network of agencies and institutes in charge of monitoring and assessment of marine contaminants and of marine research activities in order to share experience, knowledge, information and protocols at ADRION scale;
- ❖ Define best practices to manage marine pollution with a common and harmonized approach, from environmental monitoring to Environmental Impact Assessment and decommissioning of offshore platforms;
- ❖ Collect, harmonize, validate, make accessible datasets of contaminants for the whole Adriatic - Ionian region through a common and already consolidated infrastructure, and provide harmonized data visualizations tools specifically implemented by HarMoNIA;
- ❖ Share knowledge, collect available information and use modelling tools for the development of a methodological proposal to evaluate pollution dispersion risk on coastal areas and provide risk index and coastal vulnerability maps for the ADRION region;
- ❖ Establish a dialogue among scientific institutions, regional/national authorities, environmental agencies, the private sector and international organizations, towards an effective marine environmental governance.

5. Results

Sharing data, information and best practices for monitoring, assessing and managing pollutants in the marine environment represent the core of HarMoNIA. Several guidelines to improve harmonization in monitoring, data Quality Control, Environmental Impact Assessment of offshore activities and decommissioning procedures have been realized. Specific tools to discover and access data and information needed to evaluate the status of the marine environment and the



pollution dispersion risk have been implemented and are available on HarmoNIA website (<https://harmonia.adrioninterreg.eu/>).

Based on the comparison of procedures adopted by institutions in charge of monitoring the marine environment in 6 countries of the ADRION Region and taking into consideration the requirements of the EU legislation and the decisions adopted by Barcelona Convention (UNEP-MAP), as well as by OSPAR (work based on deliverables: D1.1.1, D1.1.2, D1.1.3, D1.2.1, D1.2.2, D1.3.1, D1.3.2¹), HarmoNIA has implemented methodological proposals for harmonized monitoring and data Quality Control (Part I), for harmonized Environmental Impact Assessment of offshore platforms (Part II) and for monitoring and decommissioning procedures (Part III) (<https://harmonia.adrioninterreg.eu/library/harmonia-methodological-proposals>)

HarmoNIA Methodological proposals



- Part I: Harmonizing monitoring of marine contaminants and sharing data Quality Control procedures
- Part II: Harmonizing Environmental Impact Assessment (EIA) procedure of offshore platform installation and produced formation water (PFW) discharge
- Part III: Harmonizing monitoring and decommissioning procedures of offshore platforms

In order to enable and facilitate the access to harmonized data on marine contaminants for the ADRION region, HarmoNIA promoted the use of standard and consolidated tools and services implemented at European level and shared knowledge and expertise within the partnership to adopt the same data management protocols. Two operational tools developed by HarmoNIA facilitate access, use and re-use of marine data among countries bordering the Adriatic -

¹ All Scientific and technical project deliverables are available on: <https://harmonia.adrioninterreg.eu/library/project-deliverables>



Ionian Seas and demonstrate a common approach for pollution risk assessment from sea-based sources.

Now, it is easy to find data on marine contaminants for the ADRION region. About 5,666 data sets of contaminants, from 1979 to 2018, have been gathered in one data depository, the HarmoNIA data portal (<http://harmonia.maris2.nl/search>). Data visualization tools allow users to discover spatial and temporal trends of concentrations of a large variety of chemical contaminants, measured in seawater, sediments and biota (<https://vrtlac.izor.hr/ords/harmonia/>). At the same time detailed geo-referenced information collected at ADRION scale on the natural capital of the Adriatic -Ionian Seas, the human pressures and vulnerable areas can be found in the HarmoNIA geo portal on vulnerability of coastal areas (<http://jadran.izor.hr/harmonia/>). Based on the information on vulnerability and on hazards in coastal areas and on specific outputs from hydrodynamic and oil spill modelling, geospatial information required to assess coastal vulnerability to contaminant dispersion risk are available on HarmoNIA GeoPortal on Vulnerability of coastal areas. Maps of contaminant dispersion risk index are based on the methodological proposal to assess the risk of oil spill dispersion proposed in the framework of HarmoNIA (work based on deliverables: D2.1.1, D2.1.2, D2.2.1, D2.2.2, D2.3.1, D2.3.2, D3.1.1, D3.1.2, D3.2.1, D3.2.2, D3.2.3).

HarmoNIA data & information tools

- Finding data on marine contaminants:

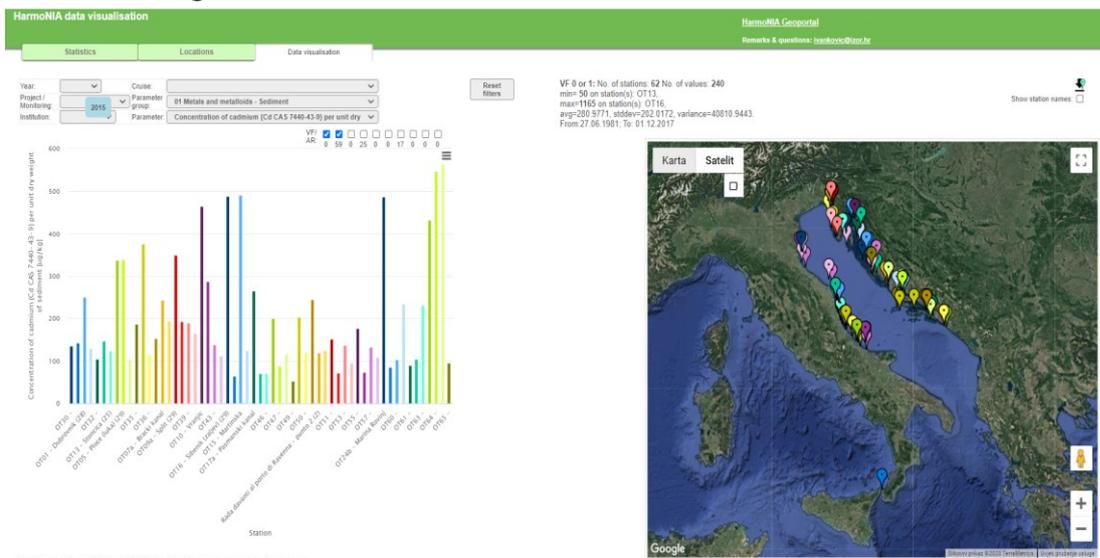


The screenshot displays the HarmoNIA data portal interface. At the top left, there is a header with the Interreg ADRION logo and the HarmoNIA title. Below this, a blue banner reads "Harmonization and Networking for contaminant assessment in the Ionian and Adriatic Seas." The main interface includes a "DATASETS" section with a search bar and a "Proceed to check out" button. A "LAYER CONTROL" panel on the left lists various map layers such as "Grid Lines", "Regional sea", "Regional sea labels", "Main sea", "Main sea labels", "Bathymetry", "Blue Marble", and "World". A central map shows the Adriatic and Ionian Seas with a color-coded risk index overlay. On the right side, there is a vertical toolbar with icons for "Enlarge map", "Help", "Position", "Index", and other navigation functions. At the bottom of the page, there is a row of logos for partner organizations including OGS, ISPRA, NIB, ARSO ENVIRONMENT, UCG, and hcmr.



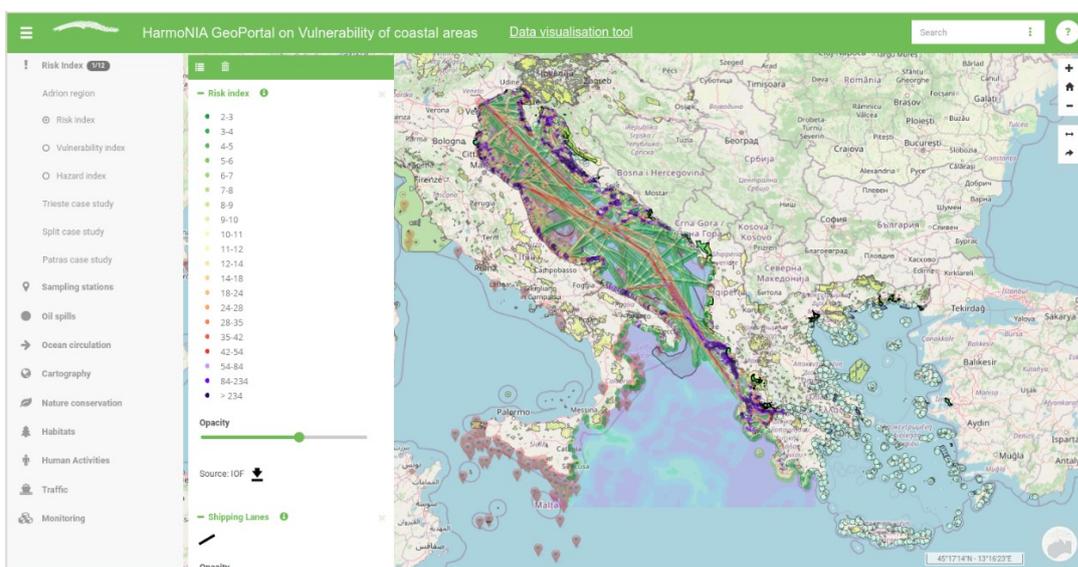
Allows to search for data and access to over 5.600 harmonized and validated datasets on marine contaminants (e.g. heavy metals, hydrocarbons, antifoulants, pesticides, biocides and polychlorinated biphenyls) measured in seawater, sediment and biota, with more than 95.000 single measurements available for more than 2.100 sampling stations.

Visualizing contaminant concentrations:



The standard approach and the harmonized data management system allows to easily compare concentrations of contaminants measured by different countries. The visualization system is interactive and easily allows to filter and visualize desired information, to compare the spatial and/or temporal variability of a specific contaminant concentration among different monitoring stations.

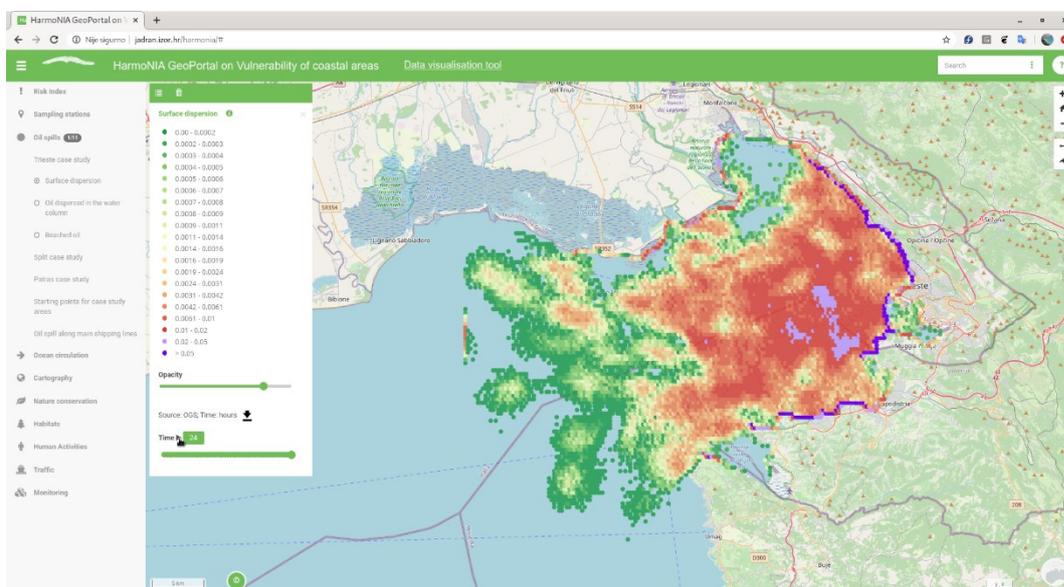
Evaluating coastal vulnerability and risk to contaminant dispersion:





Georeferenced information needed to evaluate pollution hazards, coastal vulnerability and risk of pollution dispersion has been collected, harmonized and made accessible, together with hydrodynamic and oil-spill dispersion model results, in order to support transnational cooperation for management and intervention in the case of pollution accidents, to safeguard ecosystem services. Simulations of oil spill dispersion and beached oil in 3 case study areas (the Gulf of Trieste, the Bay of Split and the Patras Gulf), chosen for the high maritime traffic and overlap of several maritime activities and vulnerable environmental aspects, as well as for oil spill simulated from main shipping lines, are made available to assist transnational cooperation in addressing common threats.

Simulation of oil spill surface dispersion in the Gulf of Trieste (animation available).



6. Outputs

HarmoNIA not only provided guidelines and tools for pollution management in the ADRION area, but also put down strategies and roadmaps for next steps ahead (<https://harmonia.adrioninterreg.eu/library/harmonia-outputs>).

For the effective implementation of this plan the HarmoNIA partnership has been committed to a transnational network of institutions ‘sharing expertise and information towards harmonization of monitoring of contaminants in the marine environment, data management and visualization’, which is envisaged to expand beyond the project’s partnership for the next 3 years.



HarmoNIA outputs



- HarmoniA Strategy I for harmonized monitoring and assessment of contaminants in the marine environment of the Adriatic-Ionian Region
- HarmoniA Strategy II for a shared and harmonized evaluation of the risk due to contaminant dispersion from different sources of pollution, in the Adriatic-Ionian Region.

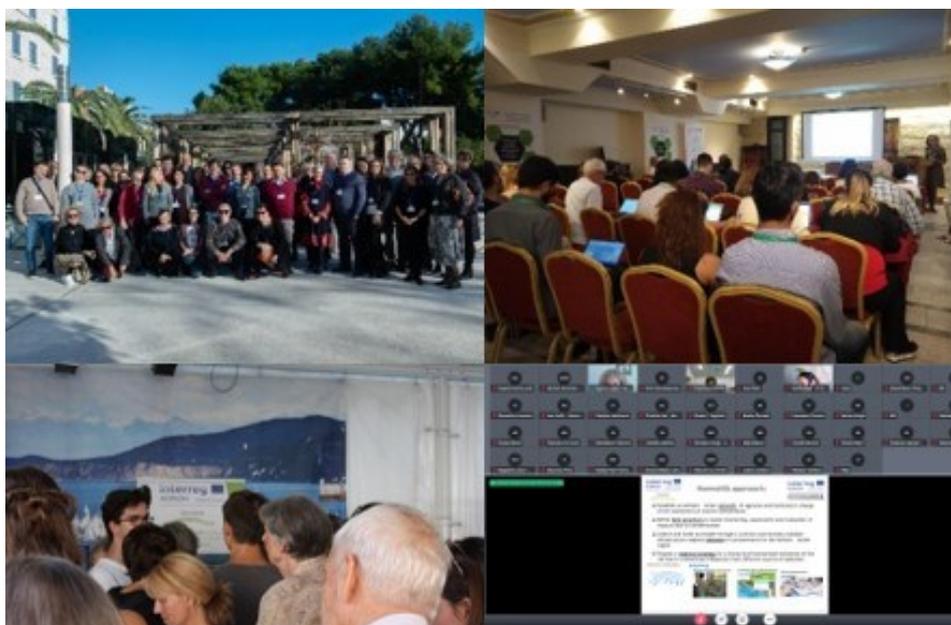


- HarmoniA Transnational Network of Institutions Sharing expertise and information towards harmonization of monitoring of contaminants in the marine environment, data management and visualization.



7. Feedbacks from the society (general and specific)

- Constructing dialogue in the ADRION region



HarmoNIA has worked at the interface of science and policy by establishing a dialogue among scientific institutions, regional/national authorities, environmental agencies, the private sector and international organizations, towards an effective marine environmental governance. In order to address and agree on the main needs of the ADRION region, 150 stakeholders from all ADRION countries were engaged through 6 stakeholder workshops, 3 of them online, and 4 questionnaires targeted to competent institutions as well as to the general public, designed to collect information on priorities, gaps and needs to address marine pollution.

Constructive dialogue was established and consolidated with a variety of stakeholders during HarmoNIA international workshops in Athens (Greece), Split (Croatia), Patras (Greece), through several national and international meetings, and, finally, by a series of online workshops “From good data to good decisions: knowledge sharing for harmonized policies on contamination issues in the ADRION seas. From monitoring to risk assessment” involving a wide range of local, regional, national and international bodies. Raising public awareness on problems of marine pollution was achieved during the European Researchers Night in 4 countries (Italy, Slovenia, Croatia, Greece) (<https://www.youtube.com/watch?v=yaej1STGj2w&t>), also through dedicated questionnaires.

Three scientific papers based on HarmoNIA activities have been published to address the research community, and are available at open access on Frontiers of Marine Science:

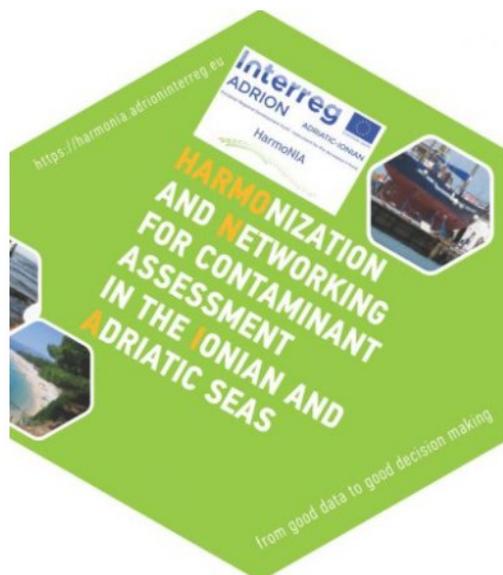
<https://doi.org/10.3389/fmars.2020.571365>
<https://doi.org/10.3389/fmars.2020.00717>

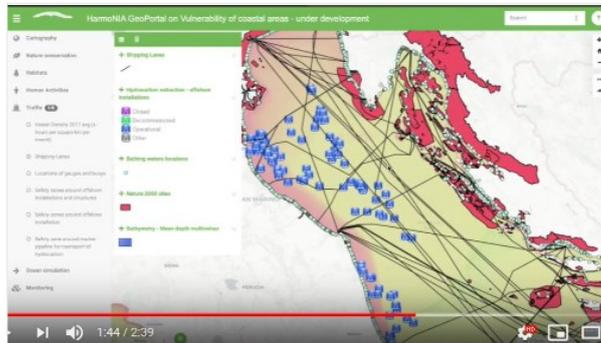


and on Water:

<https://doi.org/10.3390/w12092460>

In order to disseminate the project results and outcomes and to promote and facilitate the use of HarmonIA tools, several leaflets, newsletters, video tutorials and dissemination videos have been realized and are available in the Library of the project website: <https://harmonia.adrioninterreg.eu/library>





HarmonIA Video Tutorials





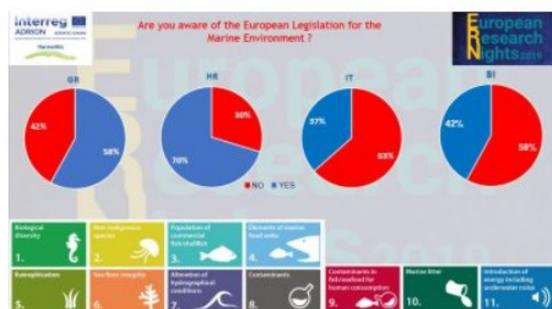
Stakeholder views:



Start building our network:



General public perception of pollution:



Though all these activities, HarmonIA has reached, and even achieved more than planned, all targets of communication, engaging relevant authorities in charge of MSFD and IMAP of the Barcelona Convention (JRC, UNEP/MAP, MEDPOL, REMPEC, the MSFD Member State Expert Group), management bodies in charge of marine monitoring (regional and national environmental agencies), universities, research institutes, interested groups and NGOs. Lastly, increase awareness in the general



public was achieved, involving more than 250 participants in the EU Researchers' Night through general public questionnaires.

COVID19 emergency affected HarmoNIA activities in terms of cancellation at the very last moment of the physical final project meeting and stakeholder workshop and in slowing down the overall activities. Thanks to the joint efforts from all partners and a strong cooperation and sense of responsibility, activities were rescheduled and reorganized in videoconference modality and all projects commitments were respected. In addition, the organization of videoconferences replacing the "physical meeting" offered the opportunity to reach relevant stakeholders who would not have attended a physical meeting and was considered as a positive occasion to engage a larger and relevant audience.

8. Next steps

HarmoNIA is involved in capitalization activities within ADRION Thematic Cluster n.2 "Coastal and Marine Environment management" with the aim of capitalizing results, tools and outputs to better address EUSAIR challenges. The ongoing activities are aimed to identify data and information provided within the cluster to face ADRION challenges, to analyse strengths, weaknesses, opportunities and threats of the cluster projects and to identify gaps and needs to address coastal and marine environmental management in the ADRION region. Several cluster meetings have been organized and documents to identify new project ideas based on identified gaps and needs have been drafted.



ADRION HarmoNIA Final event
 &
ADRION Thematic Cluster on Coastal and Marine Environment management activities
 Supporting MSFD, MSP and Protocols of Barcelona Convention

HarmoNIA Stakeholder workshop and ADRION Cluster meeting 18.6.2020



9. HarmoNIA in numbers

- ✓ 3 Methodological proposals for harmonized monitoring, Environmental Impact Assessment (EIA) and decommissioning of offshore platforms;
- ✓ 1 Methodological proposal for assessing risk index of contaminant dispersion
- ✓ More than 5.600 harmonized and validated datasets on marine contaminants (e.g. heavy metals, hydrocarbons, antifoulants, pesticides, biocides and



ARSO ENVIRONMENT
 Slovenian Environment Agency





- polychlorinated biphenyls) measured in seawater, sediment and biota provided by 6 ADRION countries;
- ✓ 3 web-based tools specifically implemented to discover and access data and information needed to evaluate the status of the marine environment and to evaluate pollution dispersion risk;
 - ✓ 2 Regional Strategies to improve coherence in monitoring efforts and coordination of actions in case of pollution accidents;
 - ✓ 1 Transnational Network of institutions sharing expertise and information for harmonized marine monitoring to tackle environmental vulnerability;
 - ✓ 6 international stakeholder workshops, 3 of them online, to agree on regional needs and share HarmoNIA results and outputs;
 - ✓ 3 questionnaires targeted to competent institutions to collect information on priorities, gaps and needs to manage marine pollution in the ADRION region;
 - ✓ 1 questionnaire dedicated to the general public to raise people awareness on marine chemical contaminants;
 - ✓ Active participation to workshop and to questionnaires of 150 of stakeholders from local, regional and national authorities, academia, SME, NGOs and international organizations;
 - ✓ 4 dissemination videos;
 - ✓ 3 video tutorials;
 - ✓ 3 leaflets in all ADRION languages;
 - ✓ 3 Newsletters;
 - ✓ 3 open access scientific publications;
 - ✓ 1 book chapter for “The Montenegrin Adriatic Coast: Marine Chemistry Pollution”;
 - ✓ 5 abstracts for presentations at international scientific conferences;
 - ✓ More than 80 social media posts on Facebook and twitter;
 - ✓ Many bilateral presentations to local, regional and national stakeholders.

10. HarmoNIA motto

“From good data to good decisions: knowledge sharing for harmonized policies on contamination issues in the ADRION seas. From monitoring to risk assessment”





HarmonIA partnership:



- Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (OGS), Italy (**Lead Partner**, contact: Marina Lipizer, mlipizer@inogs.it)
- Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), Italy
- Institute of Oceanography and Fisheries (IOF), Croatia
- Hellenic Centre for Marine Research (HCMR), Greece
- National Institute of Biology (NIB), Slovenia
- Ruder Boskovic Institute (RBI), Centre for Marine Research, Croatia
- Public institution University of Montenegro - Institute of Marine Biology (UoM-IMBK), Montenegro
- Region of Western Greece (RWG), Greece
- Slovenian Environment Agency (ARSO), Slovenia
- Agricultural University of Tirana (AUT), Faculty of Agriculture and Environment, Department of Aquaculture and Fisheries, Albania

Associated partners:

- MISE - Ministero dello Sviluppo Economico - Direzione Generale per la sicurezza anche ambientale della attività minerarie ed energetiche. Ufficio nazionale minerario per gli idrocarburi e le georisorse. Italy
- Ministry of Environment and Energy. Croatia
- Ministry of Sustainable Development and Tourism. Montenegro
- Durres Municipality. Albania