



PROYECTO COFINANCIADO
POR LA UNIÓN EUROPEA
Investigación
e Innovación



Workshop on Cumulative Impact Assessments

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Governo dos Açores



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List of abbreviations

IU-ECOQUA	University Institute of Sustainable Aquaculture and Marine Ecosystems
CINEA	European Climate, Infrastructure and Environment Executive Agency
EMFAF	European Maritime Fisheries And Aquaculture Fund
HELCOM	Baltic Marine Environment Protection Commission
CNR-ISMAR	National Research Council- Institute of Marine Science
SHOM	French hydrographic and oceanographic Centre
FRCT	Regional Fund of Science and Technology
UMA	University of Malaga
MARE	Marine and Environmental Sciences Centre
ARDITI	Regional Agency for the Development of Research Technology and Innovation
MSFD	Marine Strategy Framework Directive

1. Introduction

In 2017, the first *Maritime Spatial Planning, Ecosystem Approach and Supporting Information Systems (MaPSIS 2017)* International Conference took place in Las Palmas de Gran Canaria, Spain. During four days the current state of the art regarding Maritime Spatial Planning (MSP) was explored, including the presentation of experiences in the application of the ecosystem approach, integration with environmental planning and data management. A special issue of *Ocean and Coastal Management Journal*, [vol.166](#), collected some of the key studies presented during the Conference.

From MapSIS 2017 till today, there has been a huge development in MSP, mainly in the fields of policy, implementation and research. Now that Maritime Spatial Planning processes are being developed in the European countries and fostered all around the world, we intend for MapSIS 2022 to become a meeting place to present the current state of play: what and how has been done, what have we learned in the process, and what steps remain to be further explored.

The MapSIS 2022 took place in Las Palmas de Gran Canaria (Spain), co-organized by the [International Symposium on Marine Science \(ISMS\)](#) that run from the 6th-8th July of 2022. The event consisted of a one-day event, including workshops and special sessions on novel approaches for the integration of environmental and social aspects into the planning processes. For example, the allocation of the maritime sectors, land-sea interactions analysis and, especially, the **description and discussion of cumulative impact assessment approaches** and innovative methodologies associated with related data management.



1.1. Participants.

The speakers invited represented a wide range of multidisciplinary profiles. Hereunder a brief description of each of them is included.

- **Ricardo Haroun (ULPGC)**, is the current Chief of the IU-ECOQUA. He is a marine biologist, an expert on systematics, sustainability and conservation of marine biota, with more than 170 scientific publications related to biodiversity and sustainable use of marine resources. Actively working on marine plants, marine spatial planning, environmental interactions, and ecosystem services. He is a member of the Commission on Ecosystem Management (CEM) from the UICN and an expert for the Government of the Canary Islands in the Biodiversity Work Programme for the Islands.
- **Anja Detant (CINEA)**, is a project advisor at the Sustainable Blue Economy Unit of CINEA that implements parts of the EMFA funds on behalf of the European Commission (DG Maritime Affairs and Fisheries). She manages actions on governance and technical assistance in the field of sea-basin strategies (WestMED), maritime spatial planning and blue skills.
- **Joni Kaitaranta (HELCOM)**, works as a Data Coordinator at HELCOM. His tasks are to coordinate data collection under the HELCOM framework to support assessments and make assessment outputs and underlying data used for assessments available. His background is in information technology, GIS and marine science. He has been taking part in several MSP and environment impact assessment-related projects such as PanBalticScope, BalticLines and HELCOM State of the Baltic Sea reports. He is also a co-chair of the EU MSP Technical expert group on data.
- **Marta Ballesteros**, works at the CETMAR Fisheries Socioeconomic Department. She holds a PhD in Marine Science, Technology and Management, a Master in Economics and a Degree in Political Science. She co-chairs the Socioeconomic Subgroup of the TEG in MSP Data, is a member of the ICES Working Group on Balancing Economic, Social and Ecological Objectives (WGBESEO) and is part of the Emodnet Human Activities Team.
- **Stefano Menegon (CNR-ISMAR)**, is an Environmental Engineer with a PhD in Information Technology for Environmental Science. He is an expert on environmental and predictive modelling, geospatial analysis, geostatistics, complex data integration, data sharing strategies, interoperable infrastructure, and collaborative geospatial web applications. Currently, he is a senior research technologist at the CNR Institute of Marine Science (Venice, Italy) working on the design and development of geospatial tools to support Integrated Coastal Zone Management (ICZM) and Maritime Spatial Planning (MSP) activities and, more in general, in translating environmental challenges into data-driven models and tools. Since 2013, he is coordinating the development of the Tools4MSP modelling framework.

- **Denise O’Sullivan**, is a Data Analyst with the Marine Institute, in Ireland. She has worked as a Data Analyst for 4 years across different industries. Her work now focuses on data related to Marine Spatial Planning and Marine Strategy Framework Directive; how we can use the same data to report on both initiatives and how we can catalogue it effectively through the use of metadata standards.
- **Pascal Derycke (Marine Analyst)**, works as a Data engineer at the EU Health information system unit of the Belgian public health Institute Sciensano. He contributes to projects on semantic interoperability and federated analysis in a future European Health Data Space. He has been the Technical coordinator of the European Marine Observation and Data Network (EMODnet) funded by the Directorate-General for Maritime Affairs and Fisheries (DG MARE) of the European Commission and worked for many years at the Joint Research Centre of the European Commission as a Scientific programmer and Data analyst assessing the environmental status of marine and coastal waters.
- **Andrej Abramic (IU-ECOQUA)**, holds a PhD in hydraulic and environmental engineering from the University Politecnica of Valencia. He is currently associated with the IU-ECOQUA of the ULPGC, with extensive experience in different fields of research. He currently focuses his work on coastal environmental problems and marine pollution, environmental impact assessment, operational application in maritime spatial planning, spatial data management and monitoring, common European policies related to the marine environment and data information exchange.
- **Amedeo Fadini (CNR-ISMAR)**, has working experience in computer science in the field of Geographic Information Systems (GIS) planning and cartography, especially in the Public Sector. He holds a bachelor’s degree in Communication Science (2006) and Master’s degree in GIS and Remote Sensing (2014) qualified as Land Planner (2016). As a GIS analyst and developer, he works mainly on data infrastructure, maintenance, design and upgrades alongside the development and implementation of web-based support tools. Is currently enrolled as a PhD student with the IUAV University in Venice. His research topic is about dynamic data for MSP, since we’re in changing world the planning goals became a moving target and in implementing, monitoring and updating the plan we need to manage not only data collection but also continuous data flows.
- **Adeline Souf (SHOM)**, is the head of the marine spatial planning unit at Shom, the French hydrographic and oceanographic services. She has been working in various marine sectors for the last 10 years, starting in the offshore wind farm industry to model the ground and sit wind turbines where there is a need for planning and sharing between stakeholders’ information regarding the sea use, then as a project officer for marine natural resources sustainability in developing countries. Now working at Shom she overviews a team working on EU co-funded projects, such as MSP-MED, MSP-OR and

MSP-NBSR which will be added by 2 new projects which are about to begin at the end of the year.

- **Natali Santos (FRCT)**, is an Oceanographer and circum-navigator with multidisciplinary work experience in natural resource management, endangered species and sustainable development policies. Worked in Angola, Antarctica, Brazil, Canada and Portugal; and for 10 years collaborated in fisheries monitoring and management programs in the Azores. Since April has been the coordinator of the MSP-OR project.
- **Alejandro García-Mendoza (IU-ECOQUA)**, holds a degree in Geomatics and Topography and a master's in environmental management. He is an expert in GIS, standardization and publication of geographic data, and a tools developer in aid for marine spatial planning. He is responsible for the creation of the ULPGC Geoportal and the Decision Support System INDIMAR®, and he has collaborated with several publications related to marine spatial planning under the PLASMAR and PLAMAR+ projects.
- **Víctor Cordero-Penín (IU-ECOQUA)**, is a PhD candidate, working right now in the PLASMAR+ project at the IU-ECOQUA of the University of Las Palmas. His research focuses on coastal and ocean planning and management aiming to contribute to the sustainable use of our natural heritage. In the past two years, he has been more specifically researching how to conserve the marine ecological structures and processes, while ensuring the provision of goods and services that contribute to our well-being.
- **David Rodríguez (UMA)**, works as a Senior Researcher on Biodiversity Conservation and Management at the European Topic Centre, University of Malaga. His work and research interests include: protected area effectiveness evaluation; sustainability assessments at different ecological and spatial scales; environmental and socio-economic indicator development; impacts of environmental policies and regulations; territorial planning; environmental sociology; and ecological restoration. He is the author of 41 indexed articles, 7 books and 4 book chapters on territorial sustainability and biodiversity conservation.
- **João Monteiro (ARDITI)**, is a post-doctoral fellow at the Madeira unit of MARE within ARDITI from Madeira. He is currently coordinating multiple research activities and projects especially focusing on holistic approaches to ecological studies and in the integration of remote sensing from aerial imagery, drones and marine remotely operated vehicles and artificial intelligence for methodological innovation in marine and coastal ecology.

1.2. Agenda.

Maritime Spatial Planning, Ecosystem Approach and Supporting Information Systems

MapSIS 2022

<https://isms-canarias.com/en-msp>

Date: Thursday, 7th of July 2022

Venue: Alfredo Krauss Auditorium, Las Palmas de Gran Canaria.

Avda, Ctra. del Rincón, s/n, 35010 Las Palmas de Gran Canaria, Las Palmas, España

Agenda

- 08:00 – 08:45 Participants' arrival and registration at the Technical Secretariat table.
- 08:45-09:35 **(ISMS) Plenary** Session 3: Julián Blasco, Department of Ecology and Coastal Management. *Sala/Room: Jerónimo Saavedra.*

MapSIS 2022 – Sala / Room: Atlántico.

- 09:45 – 10:00 **MapSIS 2022 Introduction and welcome** - Ricardo Haroun, University Institute for Research in Sustainable Aquaculture and Marine Ecosystems (IU-ECOQUA) at the University Las Palmas de Gran Canaria (ULPGC).

Technical Expert Group on MSP data (TEG) dedicated session – Results and current developments. Moderating the session Andrej Abramic, IU-ECOQUA, ULPGC.

- 10:00 – 10:15 **Dedicated session plenary** - Anja Detant, European Climate, Infrastructure and Environment Executive Agency (CINEA).
- 10:15 – 10:30 **Basemaps, MSP INSPIRE data model, EMODnet MSP model**- Technical solution for making harmonized EU MSP data layer, - Joni Kaitaranta, Baltic Marine Environment Protection Commission (HELCOM).
- 10:30 – 10:45 **Initiative on development of the EU MSP data layer** within the EMODnet Human Activities Portal - Alessandro Pititto (COGEA)
- 10:45 – 10:55 **MSFD & MSP data interconnections** (Subgroup 1) - Stefano Menegon, National Research Council (CNR).

10:55 – 11:05 Development of the **MSP metadata profile** (Subgroup 2) - Andrew Conway and Denise O’Sullivan, Marine Institute.

11:05 – 11:15 **Network services for MSP** (Subgroup 3) - Pascal Derycke (Marine analyst) 11:15 – 11:30 Questions and Answers (Q&A) session

11:30 – 12:00 Coffee break

Technical Expert Group on MSP data (TEG) dedicated session –continuation of the session

12:00 – 12:10 **Socio-economic data** within the MSP (Subgroup 5) - Marta Ballesteros, Centro Tecnológico del Mar – Fundación (CETMAR).

12:10 – 12:20 **MSP data framework** (Subgroup 4) - Andrej Abramic, IU-ECOQUA, ULPGC. 12:20 – 12:30 Q&A session and discussion

MSP cross border projects, state of play and relation to the Technical Expert Group. Moderating the session Joni Kaitaranta, Baltic Marine Environment Protection Commission (HELCOM)

12:30 – 12:40 **Data use and sharing in the Mediterranean sea: MSP-MED project outcomes** - Amedeo Fadini, National Research Council - Science Marine Institute (CNR-ISMAR) and Università Iuav di Venezia (IUAV).

12:40 – 12:50 **eMSP NBSR: a community of practice on data to feed and challenges to tackle in the North and Baltic Sea Regions** - Adeline Souf, Service Hydrographique et Oceanographique de la Marine (SHOM).

12:50 – 13:00 **Advancing Maritime Spatial Planning in Outermost Regions: MSP-OR project** - Natali Santos, Fundo Regional da Ciência e Tecnologia (FRCT).

13:00 – 13:10 **Project PLASMAR+ Spatial Data Infrastructure and open Decision Support System INDIMAR for suitability zoning** - Victor Cordero Penin, IU-ECOQUA, ULPGC.

13:10 – 13:30 Q&A and wrap-up of the session

MapSIS tools hands-on sessions (I). Moderating the session Yaiza Fernandez-Palacios, IU-ECOQUA, ULPGC.

13:30 – 14:15 **PLASMAR+ Decision Support System INDIMAR** - hands on session by Alejandro García and Victor Cordero-Penin, IU-ECOQUA, ULPGC.

<http://www.geoportal.ulpgc.es/indimar/>

14:15 – 15:30 **Lunch**

MapSIS tools hands-on sessions (II). Moderating the session Inma Herrera, IU-ECOQUA, ULPGC.

In-room coffee table available during the session

15:30 – 16:15 **Marine Analyst** – hands-on session with Pascal Dryke, Sciensano <http://marine-analyst.eu/>

PLASMAR+ **Cumulative Impact Assessment session**. Moderating the session Ricardo Haroun, IU-ECOQUA, ULPGC.

In-room coffee table available during the session.

16:15 - 16:25 **Cumulative impact assessment framework applied in the Baltic Sea: HELCOM HOLAS3 SPIA** - Joni Kaitaranta, HELCOM;

16:25 – 16:35 **A risk-based Cumulative Environmental Assessment: the Tools4MSP approach**– Stefano Menegon, Consiglio Nazionale delle Ricerche (CNR).

16:35 – 16:45 **Marine pressure hotspot assessment for the Kingdom of Saudi Arabia** - David Rodriguez, Universidad de Málaga (virtual presentation)

16:45 – 16:55 **Cumulative Impact Assessment concept within the PLASMAR+ project** - Andrej Abramic, IU-ECOQUA, ULPGC

16:55 – 17:15 Q&A and wrap-up of the session

MapSIS tools hands-on sessions (III). Moderating the session Victor Cordero-Penin, IU-ECOQUA, ULPGC.

In-room coffee table available during the session.

17:15 – 18:15 **Integrating unmanned aerial and surface vehicles in coastal mapping** - João Monteiro, Agência Regional para o Desenvolvimento da Investigação, Tecnologia e Inovação (ARDITI).

18:15 -- 18:30 Closure session of MapSIS 2022

18:30 -- 20:00 **Coffee break** + ISMS poster sessions

2. Cumulative Impact Insights

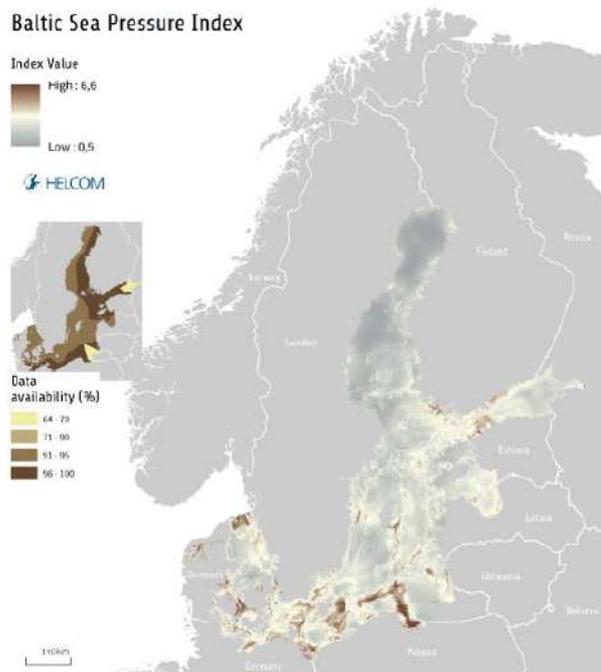
Four presentations were especially related to cumulative impact assessments (CIA) during the workshop. These presentations' main approach, objectives and overall results are summarized below.

3.1. Cumulative impact assessment framework applied in the Baltic Sea: HELCOM HOLAS3 SPIA.

Presented by: Joni Kaitaranta

This approach spatially analyzes the different pressures derived from maritime activities and the capacity of these to alter the state of ecosystem components based on their sensitivity. This results in a Baltic Sea Pressure Index through the spatial aggregation of pressure layers (Figure 1) and a Baltic Sea Impact Index through the interrelation of pressures and ecosystem components by a sensitivity matrix (Figure 2).

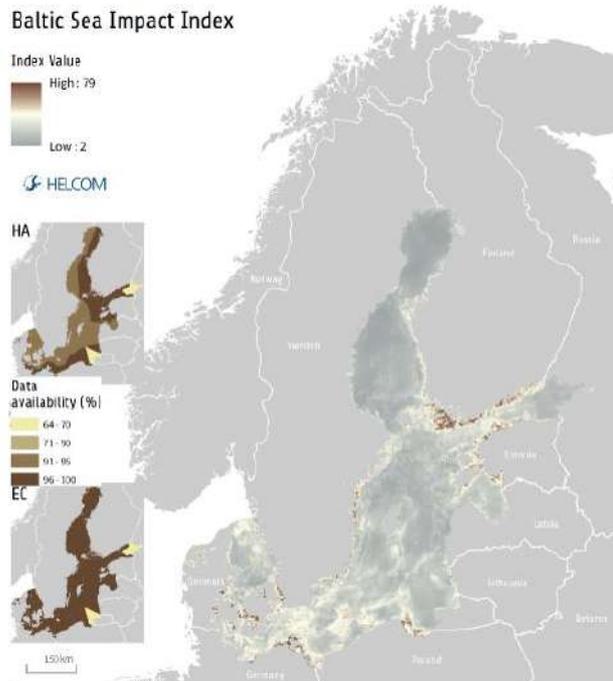
Baltic Sea Pressure Index



- Spatial distribution of cumulative pressures in 1x1 km grid
- Based on
 - 18 aggregated pressure layers (based on 39 human activities)
 - Weighted with the average sensitivity scores on each pressure

Figure 1. Gives information on the development process of the Baltic Sea Pressure Index. Source: Joni Kaitaranta's presentation.

Baltic Sea Impact Index



- Spatial distribution of cumulative impacts on habitats in 1x1 km grid
- Based on
 - 18 aggregated pressure layers (based on 39 human activities)
 - 36 ecosystem components layers
 - Sensitivity score matrix

Figure 2. Gives information on the development process of the Baltic Sea Impact Index. Source: Joni Kaitaranta's presentation.

The author of this presentation mentions some considerations regarding this approach:

- The results are not to be considered an assessment of the status of the marine environment in absolute terms, but rather as a relative distribution of potential pressures and impacts, effectively describing patterns of most impacted areas.
- The results provide a framework to communicate these patterns and to highlight hotspots and areas where further attention and studies might be needed.
- Provides the possibility to apply scenario-approach (editing input human activity datasets e.g. new wind farms).

3.2. A Risk-Based Cumulative Effects Assessment. The Tools4MSP approach.

Presented by: Stefano Menegon.

The Tools4MSP approach presents a geospatial explicit, MSFD oriented and risk-based cumulative effects assessment (CEA). This approach also analyses interrelations between maritime uses, the pressures derived from them (under the assessment of the MSFD) and how sensitive are the ecosystem receptors to them (Figure 3). Also, it incorporates an uncertainty analysis and how uncertainties may be reflected as spatial variations of the data and scientific knowledge used through the different steps of the CEA. In this sense, this approach is stated to contribute to the potential establishment of the precautionary principle in MSP.

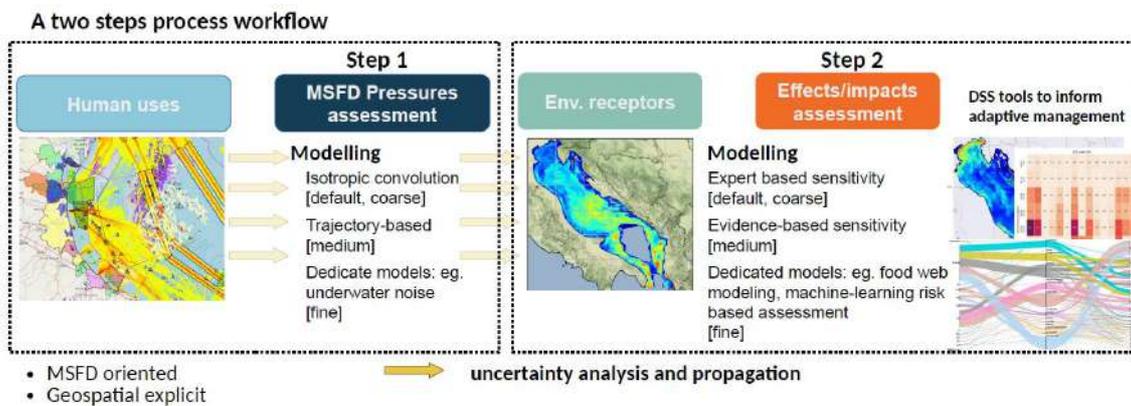


Figure 3. Gives information on the Tools4MSP process workflow on the CEA. Source: Stefano Menegon's presentation.

3.3. Marine pressure hotspot assessment for the Kingdom of Saudi Arabia.

Presented by: David Rodríguez-Rodríguez.

This approach aims to develop a holistic, indicator-based approach to identify and assess the drivers and main pressures, in the Red Sea and Arabian Gulf through a hotspot analysis (Figure 4). The approach uses the standardized DPSIR framework (drivers, pressures, state, impact and response model of intervention). It combines a series of overlapping pressures (in time and space) in relation to a series of important areas for biodiversity to identify and map areas with high levels of cumulative pressures (i.e. pressure hotspots).

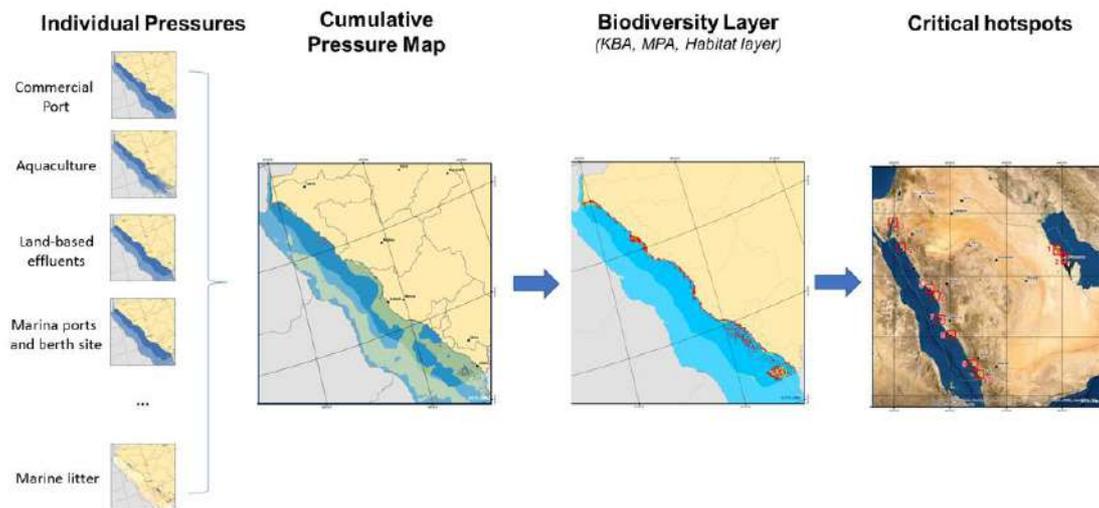
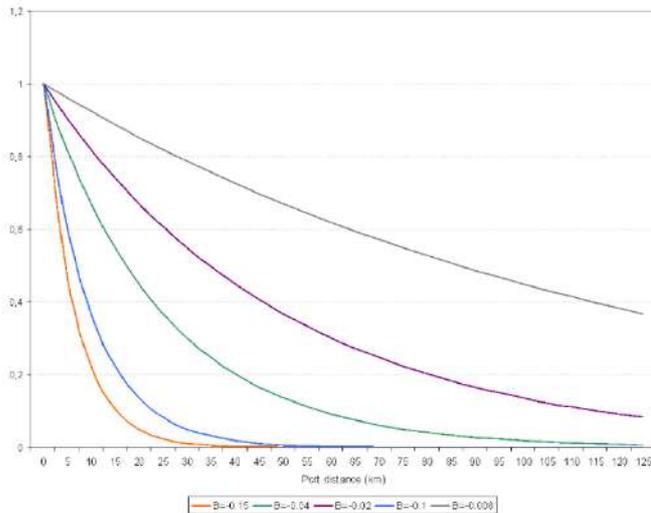


Figure 4. Gives information on the cumulative assessment process. Source: David Rodríguez-Rodríguez's presentation.

A differential aspect of this approach is that it includes the modelled distance or extension to which each pressure has a relevant affection to the environment (Figure 5).



Source: ESPON 2013

$$li = A \cdot \exp(-\beta \cdot di)$$

- **A** = Activity of the port (depends on the dataset used, e.g. total cargo, TEUs, cruise passengers, tonnes of liquid bulk)
- **β** = a constant representing the decay factor
- **d** = distance separating the port from each pixel

Figure 5. Graph showing how the data of the approach is processed taking as an example port sector. “The β parameter is the decay factor. The value of beta controls the range at which the influence of infrastructure can still be perceived. Small values of beta allow for influences of a port to be perceived far away (for beta = 0.008 the influence of the port is still 50 % at a distance of 100 km), while larger values of beta reduce the range of this influence (for beta = 0.15, the influence of a port is not noticed beyond 25 km)”. Source: David Rodríguez-Rodríguez’s presentation.

Some of the issues and possible improvements of this approach are described by David Rodríguez-Rodríguez as follows:

- Data comprehensiveness.
- The lack of legal or scientific thresholds to which the selected indicators could be referenced.
- Geo-statistical approach using normalized indicator values for hotspot classification.
- Equal weighting of pressures (i.e. all human activities were considered equal in terms of their potential impact) due to the lack of sensitivity of ecosystems.
- Theoretical spatial modelling of pressures.
- No forward-looking analysis included.

3.4. Cumulative Impact Assessment concept within the PLASMAR+ project.

Presented by: Andrej Abramic

This approach presents a cumulative impact assessment (CIA) based on the environmental impact assessment concept (EIA). Thus, if EIA consist of all the impacts that one maritime activity has on all ecological receptors, the CIA is considered to be the summary of EIA for all activities on all ecological receptors (Figure 6).

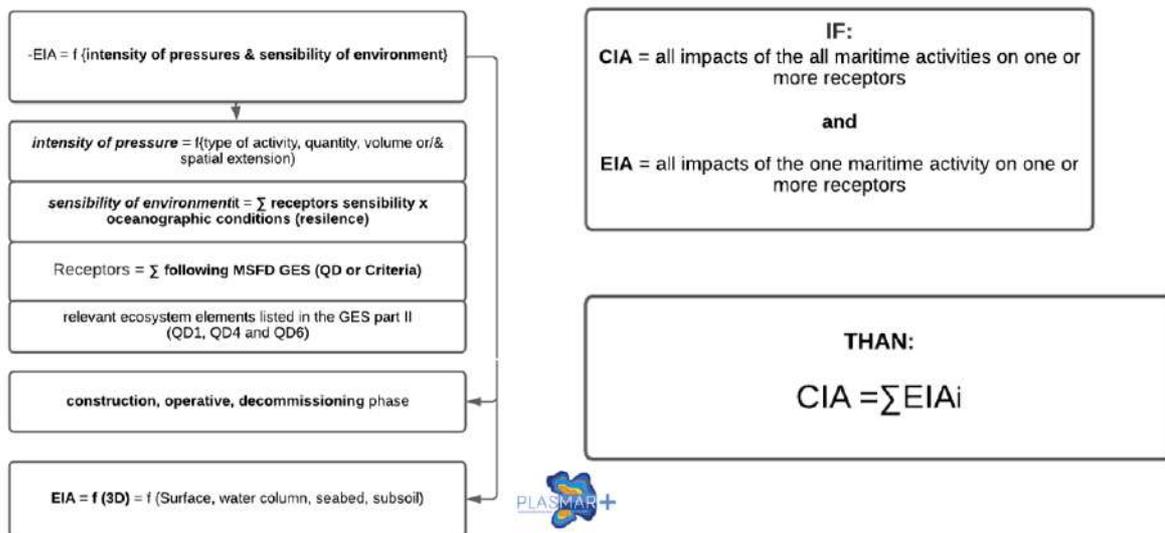


Figure 6. Gives information on the cumulative impact assessment approach. Source: Andrej Abramic's presentation.

The differential aspect of this approach is twofold. Firstly, is the multicriteria analysis statistical method employed to define the impact weight that each maritime activity has on all possible ecological receptors. Secondly, the CIA assessment is spatially done with the INDIMAR decision support system that enables to map pressures derived from the spatial distribution of maritime activities and the resulting impacts considering allocation of ecological receptors (Figure 7).

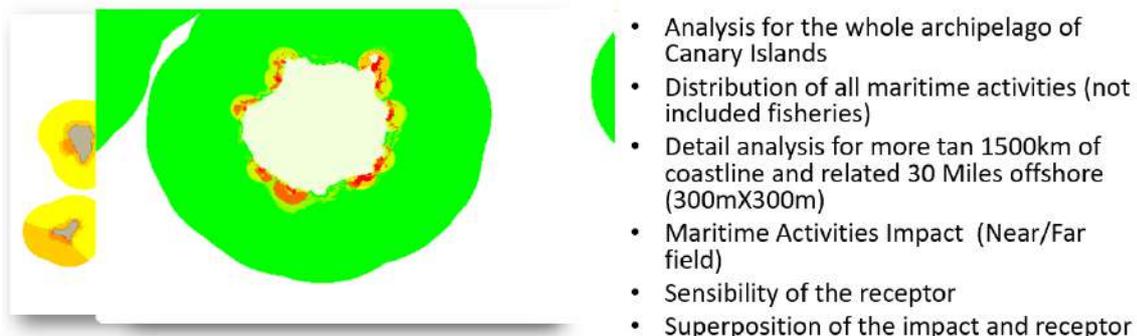


Figure 6. Show an example of a preliminary result of a cumulative impact assessment done with INDIMAR. Source: Andrej Abramic's presentation.

3. Participants' presentations and pictures

All participants' presentations and pictures of the event can be consulted and found in the following link:

<https://drive.google.com/drive/folders/1Pgi1h6DGEkLNfvwMBkO-vYqzjxLas1HZ?usp=sharing>

4. Annex I. List of attendees.



PLASMAR+ Decision Support System INDIMAR

Las Palmas de Gran Canaria/ 7th July 2022//13:30-14:15 h
Auditorium Alfredo Kraus

NAME	INSTITUTION	SIGNATURE
YERAY PÉREZ CONTRALER	GMR Canarias	
DENISE OSULLIVAN	MARINE INSTITUTE	
Bárbara Cordero	Direcció Regional do Mar - Maderna	
CHRISTINE BEZIC ALPEÑES	GRAFCAN	
TANIA SANTANA HARRERO	GRAFCAN	
ARMED EO FODINI	CNR- ISMAR & IUAV University	
STEFANO MENECON	CNR- ISMAR	
MARÍA BALGSTEROS	CETMAR CINEA	
Detant Anja	European Com.	
Beatriz Fdez Gomez	IOCAT	

NAME	INSTITUTION	SIGNATURE
Pascal DERYCKE	Maine-Analyst	
Adeline SOUF	Shom	
Jean-Baptiste SIZANNE	Shom	
LAURA PASCUAL PARENTE	TRASSATEC	
ALEJANDRA CASILLAS DÍAZ	TRAGSATEC	
ANGELA M ^o CASTELLANO SANTANA	CONSEJERÍA TRÁNSP. SÍG. Y ECOLOGÍA	
Ainara Amador Gonzalez	GRAFCAU	
Gara Trapero Hernandez	Gobierno Canario Comunidad Autónoma Ecológica	
Inmaculada Herrera Rivero	IU - ECOAQUA, ULPGC	
CANDELARIA CECILIA RUANO	IU - ECOAQUA (ULPGC)	
Joni Kaitaranta	HELCOM	
Andriy Abramic	OCP GC	
Yaira del-Palacios	IU-ECOAGUA ULPGC	
M. Alejandro García Mendoza	IU ECOAQUA	

