

ADRIPLAN Portal integrated with
data on noise sources, noise targets,
environmental data, sea uses

and

Report describing the Data Portal
and its content, including a user
manual.

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Abstract

This document describe in details all the sub-activities carried out under activity 5.3, including the following contents:

- D5.3.1 Tools4MSP (former ADRIPLAN) Portal integrated with data on noise sources, noise targets, environmental data, sea uses and customized tools. The updated and customized Portal will be maintained by CNR-ISMAR after the project end, favoring further developments and capitalization of results.
- D5.3.2 Report describing the Data Portal and its content, including Guidelines to access the SOUNDSCAPE DATA maps. The report describes data stored in the Portal or accessible through the Portal.

1. Introduction

The SOUNDSCAPE project is funded by the 2014-2020 Interreg V-A Italy - Croatia CBC Programme funded by the European Union within the “Call for proposal 2017 Standard, Priority Axis: Environment and cultural heritage within the specific call objective 3.2 - Contribute to protect and restore biodiversity. The main objective of the project is to create a cross-border technical, scientific and institutional cooperation to face together the challenge of assessing the impact of underwater environmental noise on the marine fauna and in general on the Northern Adriatic Sea ecosystem.

Within the project, the Work package 5 aims at integrating results from the established underwater noise observing system (WP3) and the analysis of ecological targets, sensitivities and possible effects (WP4) to produce soundscape maps, carry out a preliminary risk analysis and inform possible policy actions for straightforward management of underwater noise in accordance with the MSF and MSP Directives.

Data needed to develop and analyze planning measures and scenarios to mitigate environmental impacts of noise sources in the Northern Adriatic has been collected and/or updated for their integration in the Tools4MSP (former ADRIPLAN) Portal (data.tools4msp.eu) developed within the DG MARE ADRIPLAN Project and further improved within the RITMARE Project.

Consistent with this context and with the objectives set, the activities of the SOUNDSCAPE project have foreseen the set up of a complete knowledge framework on the sea uses with specific focus on potential noise sources. Information about the anthropogenic sources have been gathered from direct and indirect sources. Data collection was cross-country and concerned noise sources (maritime traffic and others), noise targets, environmental data, other relevant sea uses existing in the area. Data has been made public available and used to define and evaluate mitigation measures and scenarios (Activity 5.4).

2. Tools for supporting the decision making processes

2.1. Tools4MSP Geoplatform

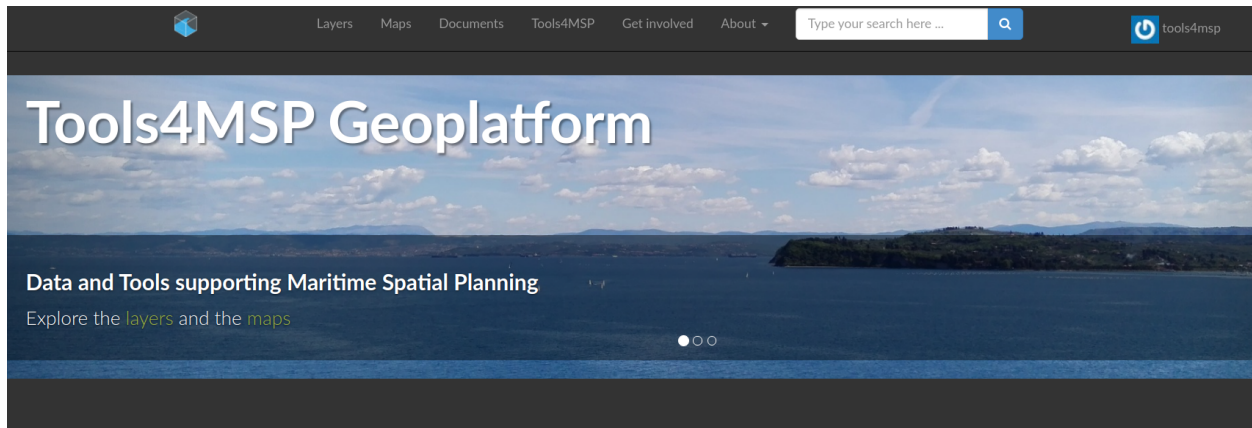


Figure 1. Tools4MSP Geoplatform home page.

SOUNDSCAPE Data Management plan has identified in the Tools4MSP Geoplatform the most suitable solution for managing and sharing the main project geospatial outcomes.

The Tools4MSP Geoplatform (former ADRIPLAN Portal) (Menegon et al., 2018a) (see Fig. 1) is a community-based, open source portal based on GeoNode, a web-based Content Management System (CMS) for developing geospatial information systems (GIS) and for deploying spatial data infrastructure (SDI). It includes over 1500 geospatial datasets, organized in the following categories: coastal defence and sand extraction, energy, environmental protection, environment and ecosystem, fisheries and aquaculture, maritime transport and tourism, miscellanea. The Geoplatform capitalizes data from other projects (e.g. Shape, CocoNet) and enables access to standard services from other geoportals (e.g. EMODnet, EU Sea Atlas). Moreover the Geoplatform provides a set of MSP-oriented web-tools such as Cumulative Effects Assessment (CEA) (Menegon et al., 2018b), Marine Use Conflict Analysis and a Marine Ecosystem Services Threat (MES-Threat) Analysis (Menegon et al., 2018c). The Tools4MSP Geoplatform is regularly updated by the Tools4MSP Development Team, the original version was developed in the context of the ADRIPLAN Project¹ and has been consolidated within the Italian RITMARE Flagship Project² and by other MSP-related projects such as SUPREME. Core functionalities of CEA/MUC have been supported by an MSP pilot study in sea areas of Emilia-Romagna Region (Italy), and

1 ADRIPLAN Project - ADRIatic Ionian maritime spatial PLANning: <http://adriplan.eu/>

2 RITMARE - La Ricerca Italiana per il Mare: <http://www.ritmare.it/en/>

incorporated as case studies analyses within the SUPREME³ and SIMWESTMED⁴ projects. Currently the web-tools are providing core functionalities within PORTODIMARE Project⁵.

Through the core functionalities of the Tools4MSP Geoplatform more than 1500 geospatial layers of the SOUNDSCAPE project have been uploaded and published. All layers include metadata (eg. title, description, date of creation, genealogy) and a web interactive interface for visualizing, exploring and querying the geospatial information. In addition, dedicated maps have been created in order to facilitate end users in exploring SOUNDSCAPE datasets. A Map provides the typical functionalities of web mapping application: simultaneous visualization and exploration of multiple layers, organization of the layers in grouped categories and tools for measures distances and areas, identify and query the geospatial features, filter and explore the attribute tables (numerical or categorical data related to the spatial features).

The Tools4MSP Geoplatform also allows to expose SOUNDSCAPE layers through standard interoperable services which allows access, consultation and visualization of SOUNDSCAPE through external application (eg. QGIS, ArcGIS or other GIS Desktop clientes). Main services are:

- OGC portrayal service (e.g. Web Map Service; (OGC - Open Geospatial Consortium Inc., 2006); Tile Map Service, (OSGeo, 2012); Web Map Tiling Service, (Open Geospatial Consortium Inc., 2010)): standard interfaces to visualize the geospatial datasets;
- OGC Web Feature Service (OGC-WFS; (Open Geospatial Consortium Inc., 2005)): standard interface to request and download geographical features across the web;
- OGC Web Coverage Service (OGC-WCS; (Open Geospatial Consortium Inc., 2008)): standard interface to request and download coverages that is, digital geospatial information representing space/time-varying phenomena;
- OGC Catalogue Service for the Web (CS-W, (Open Geospatial Consortium Inc., 2007)): standard for exposing a catalogue of geospatial resources.

Furthermore, new functionalities have been designed and implemented within the Tools4MSP Geoplatform to specifically support the SOUNDSCAPE project:

QOS to Tools4MSP connector: a backend tool to connect and synchronize the Quonops Online Services (QOS) to the Tools4MSP Geoplatform. The connector automatically downloads the underwater noise layers provided by QOS and uploads them into the Tools4MSP Geportal. The connector includes

3 SUPREME - Supporting maritime spatial Planning in the Eastern Mediterranean: <http://www.msp-supreme.eu/>

4 SIMWESTMED - Supporting Maritime Spatial Planning in the Western Mediterranean region

5 PORTODIMARE - geoPortal of Tools & Data for sustainable Management of coAstal and maRine Environment: <https://www.portodimare.eu/>

features to automatically fill in metadata and to associate the visualization styles to the layers in order to control the appearance of geospatial data.

SOUNDSCAPE content section: a dedicated web section has been implemented within the Geoportale (see Fig. 2) to present and aggregate SOUNDSCAPE-related resources.

<http://data.tools4msp.eu/tools4msp/soundinfo>

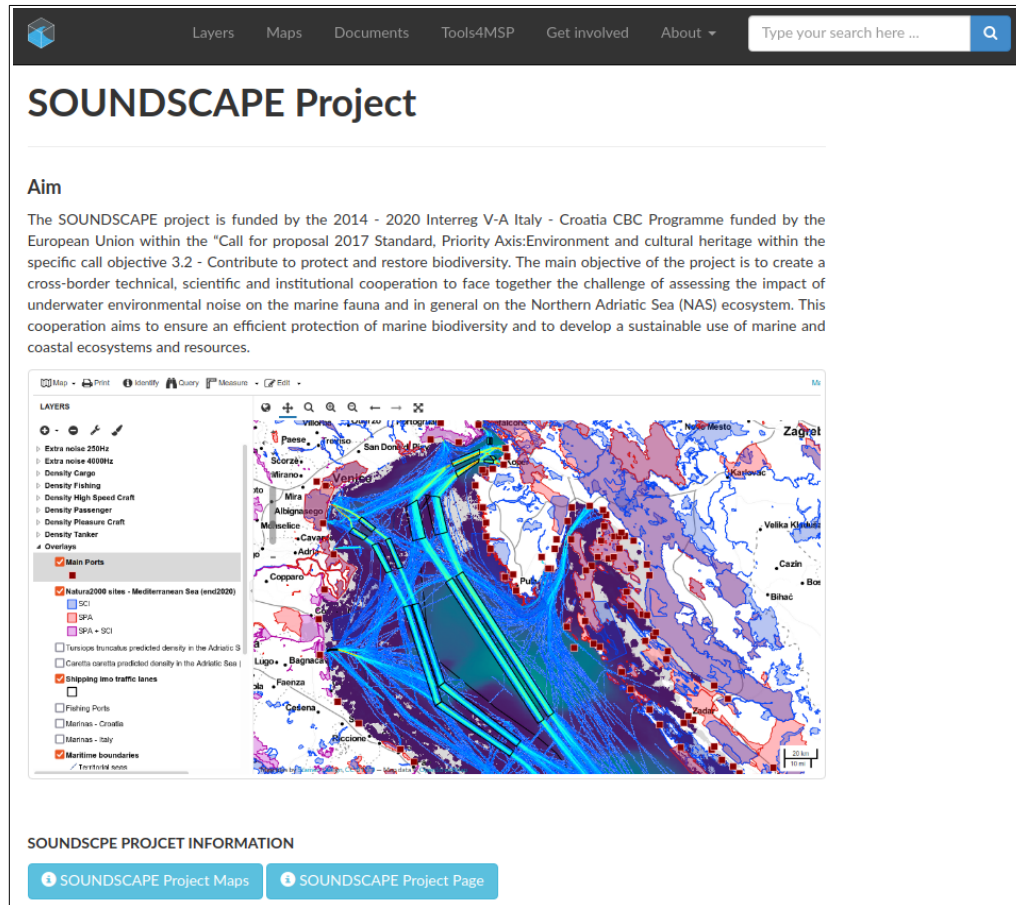


Figure 2. SOUNDSCAPE project dedicate section within the Tools4MSP Geoplatform. <http://data.tools4msp.eu/tools4msp/soundinfo>

2.2. Access the SOUNDSCAPE data map

Table 1 provides URLs to SOUNDSCAPE data and maps. The resources are online available through the SOUNDSCAPE project section of the Tools4MSP Geoplatform (Fig. 2, Table 1 – Action 2) which is aimed to inform and support multiple user categories (eg. scientists, planners, stakeholders, NGOs, citizens).

The resources (geospatial layers and interactive maps) are freely accessible, however users are required to register to the Tools4MSP Geoportal before visualizing the contents (see Table 1 – Action 1 - Sign up/registration form). Contents can be explored using all modern internet browsers (e.g. Google Chrome, Mozilla Firefox, Microsoft Edge, Apple Safari) including mobile versions and users are not required to have specific skills.

SOUNDSCAPE layers are organized in web maps (Table 1 – Action 3) to facilitate content sharing and exploration. Within each maps, geospatial layers are organized by groups and end-users are allowed to visualize multiple layers (including layers provided by external services such as EMODnet), identify the features, filter by attributes and print the map. A comprehensive map (Table 1 – Action 2, Fig. 3) presents an overview of all SOUNDSCAPE layers relevant to support decision making processes: monthly distributions of extra for the 63Hz, 125Hz, 250Hz and 4000Hz; monthly vessel densities for Cargo, Fishing, High Speed Craft, Passenger, Pleasure Craft and Tanker vessel types; bathymetry; legal status of marine areas; Natura2000 sites; *Caretta caretta* and *Tursiops truncatus* hotspots and density distributions; main ports, fishing ports and marinas.

Detailed information about the previous layers are presented in the next chapters (Chapter 3: Data contents and description, and Chapter 4: Noise assessments).

Table 1. SOUNDSCAPE online resources.

Action	Title	URL
1	Sign up/registration form	http://data.tools4msp.eu/account/signup
2	SOUNDSCAPE project (overview)	http://data.tools4msp.eu/tools4msp/soundinfo
3	SOUNDSCAPE project maps	http://data.tools4msp.eu/maps/?limit=20&offset=0&title__icontains=SOUNDSCAPE
4	SOUNDSCAPE comprehensive map	http://data.tools4msp.eu/maps/5629/view

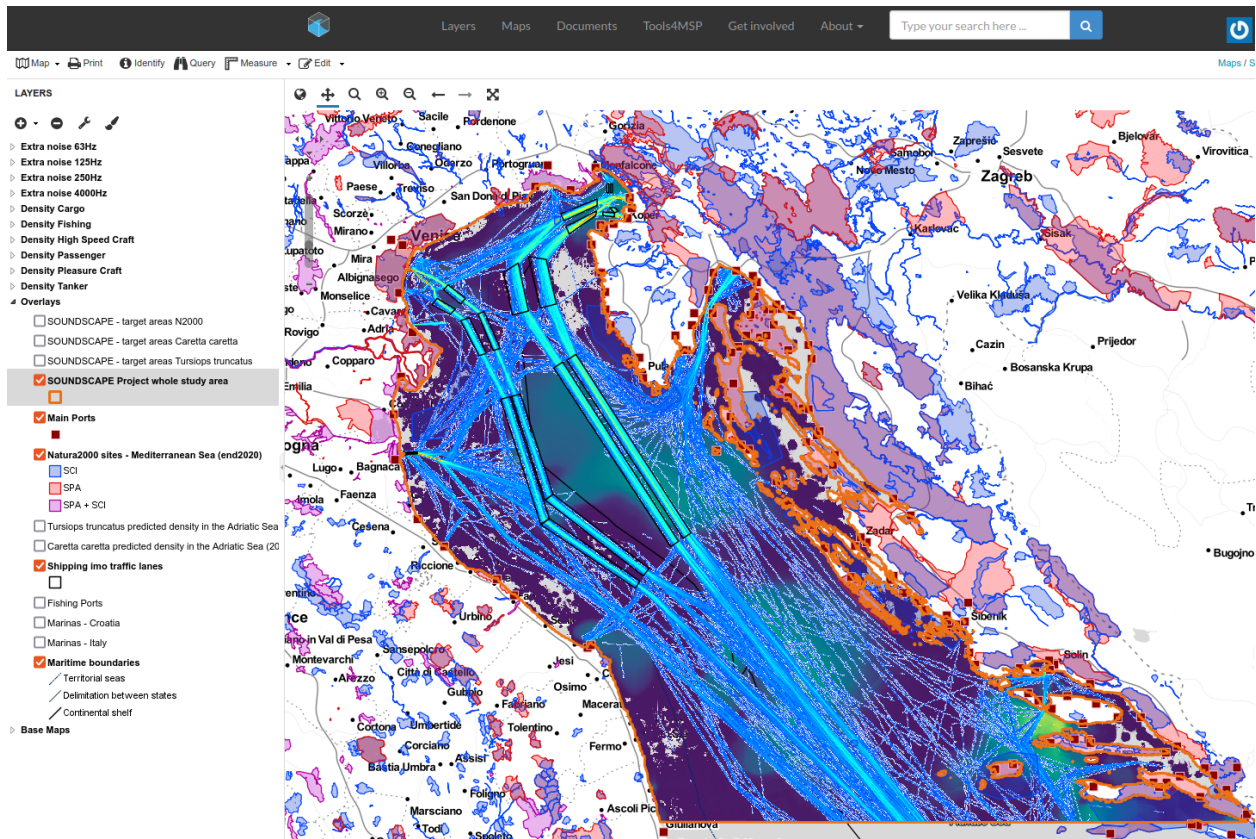


Figure 3. SOUNDSCAPE map D5.3.1 - noise sources, noise targets, and environmental data at <http://data.tools4msp.eu/maps/5629> (Note: for registered users).

3. Data contents and description

3.1. Noise sources

3.1.1. Maritime traffic from AIS data

Shipping, here intended as the transport of goods and passengers by sea, has a very high socioeconomic value in the Adriatic Sea, since it directly affects the development of all the Adriatic countries, also in terms of employment, and of many other sectors (such as tourism). Shipping may raise important issues for environmental conservation and maritime spatial planning, ranging from spatial interactions with other human activities (e.g. fisheries) to the environmental challenges for sustainable maritime transport.

Maritime tourism refers to sea-based activities such as boating, yachting, cruising, nautical sports as well as their land-based services. Nautical tourism consists mostly of boating and yachting activities. The Adriatic is one of the top nautical tourism destinations in the Mediterranean and therefore pressures from this sub-sector are significant, especially in coastal areas.

The Central-Northern Adriatic basin also host old and important fishing traditions, and its fishing ports have always been a point of reference and innovation for sea fishing. The local fisheries sectors feature small-scale fisheries, exerted mainly by fishing by vessels of less than 12 meters in length, trawling for demersal species, i.e. commercial bottom otter trawling and beam trawl fishing, and trawling for small pelagic species. The distribution of the trawling effort, both on the bottom and pelagic, presents different coverages and intensities in the study area.

The maps are based on AIS data from AIShub (www.aishub.net) and show shipping routes density in 250x250 m cell grid, covering all the Central-Northern Adriatic waters. The following ship types are available, according to the vessel type AIS code: 1 Fishing, 5 Pleasure Craft, 6 High speed craft, 8 Passenger, 9 Cargo, 10 Tanker. Data are available by month of the 2020. Both the fishing sector and nautical tourism could not be fully considered in the analyses because AIS is not mandatory on boats <15 m, which constitute a relevant segment of the sectors. Further details on the maritime traffic analysis are in Soundscape Deliverable 5.4.1 *Report on mitigation measures and scenarios to reduce underwater noise and its effects on biological targets*.

3.1.2. Maritime transport - ancillary data

All the information useful for a better understanding of maritime traffic routes and features have also been gathered.

Table 2. Geospatial data stocktake used for ancillary data.

Human use	Description	Source
Maritime Tourism	Marinas - Italy and Croatia	PagineAzzurre.com and Croatian Bureau of Statistics (elaboration Tools4MSP)
Naval base activities	Main Ports and fishing ports	EMODNET Human uses, 2019
Maritime traffic management and routes	Traffic separation scheme (TSS)	International Maritime Organization - IMO
Boundaries	Maritime boundaries	EEA - European Environment Agency

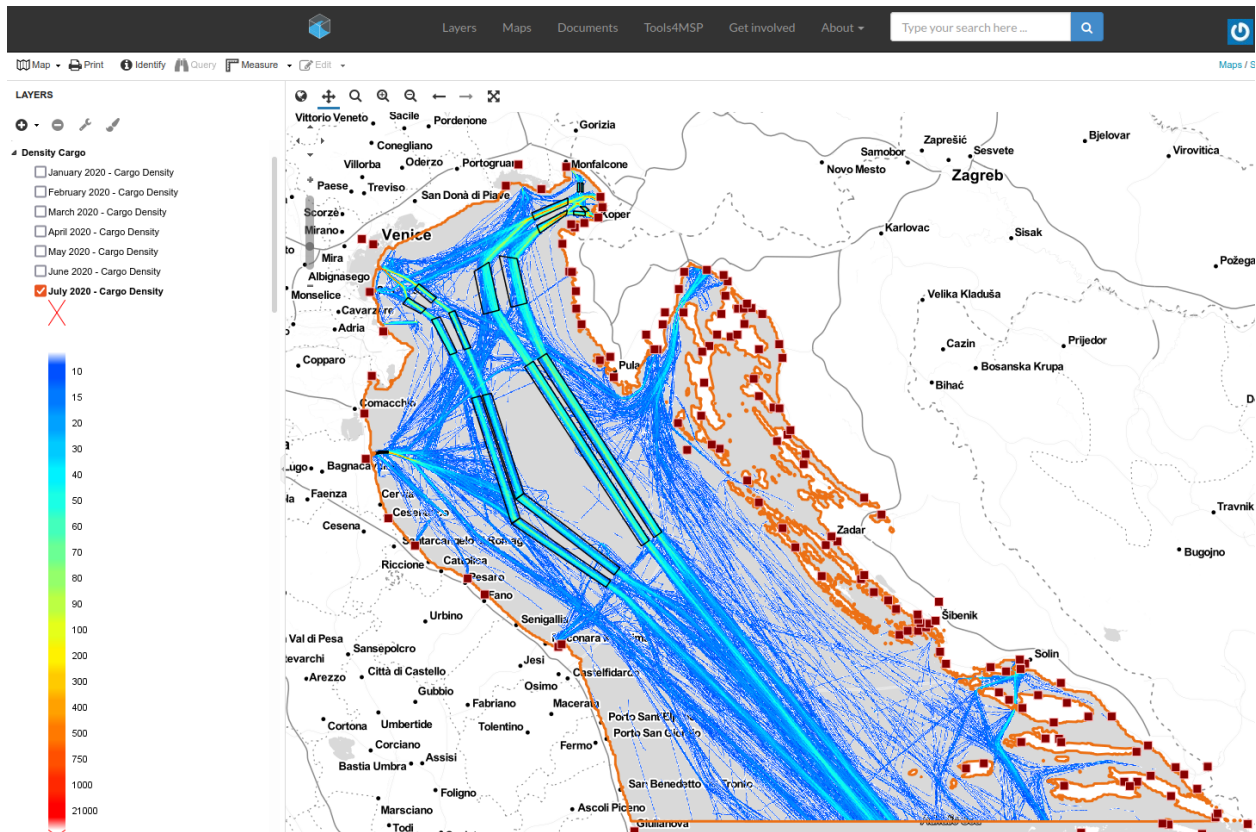


Figure 4. Cargo vessels trajectories, July 2020, IMO traffic separation schemes and main ports.

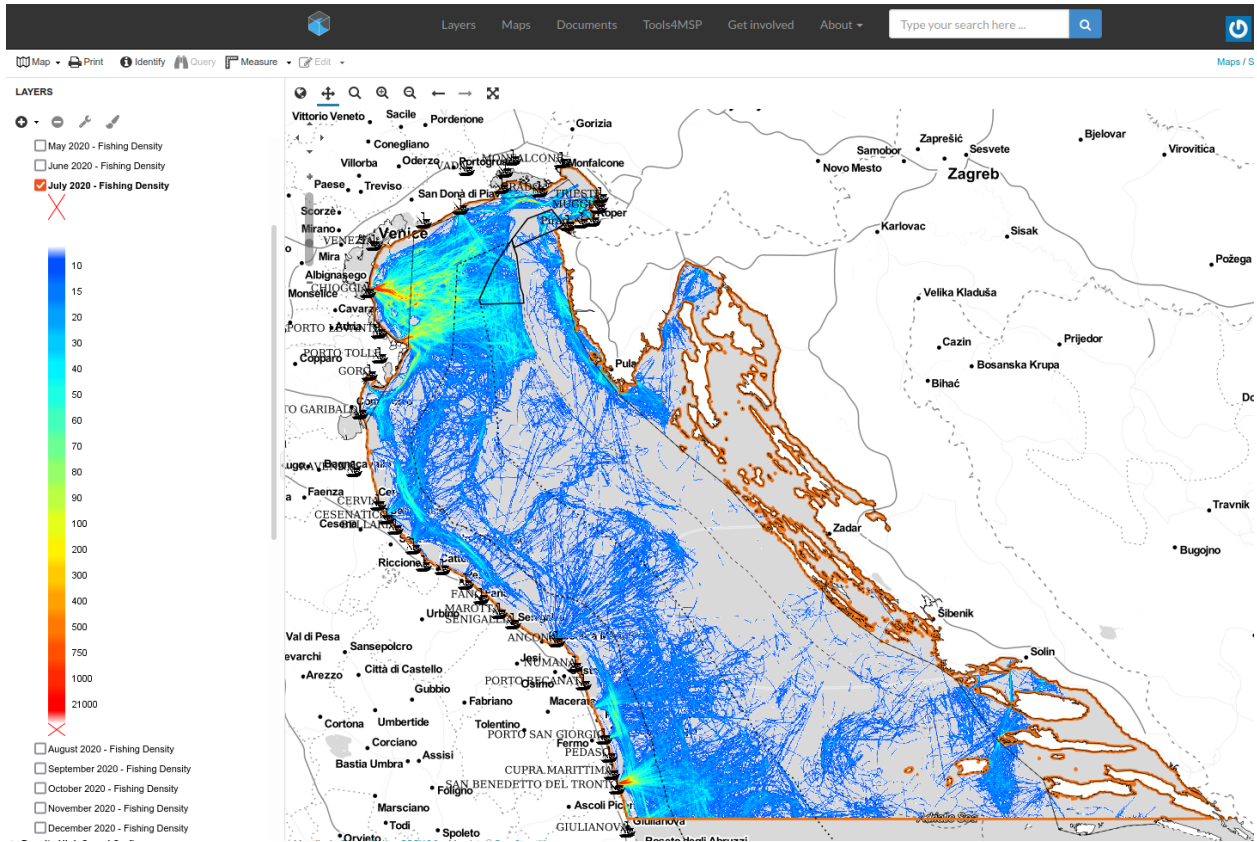


Figure 5. Fishing vessels trajectories, July 2020, and Italian fishing ports.

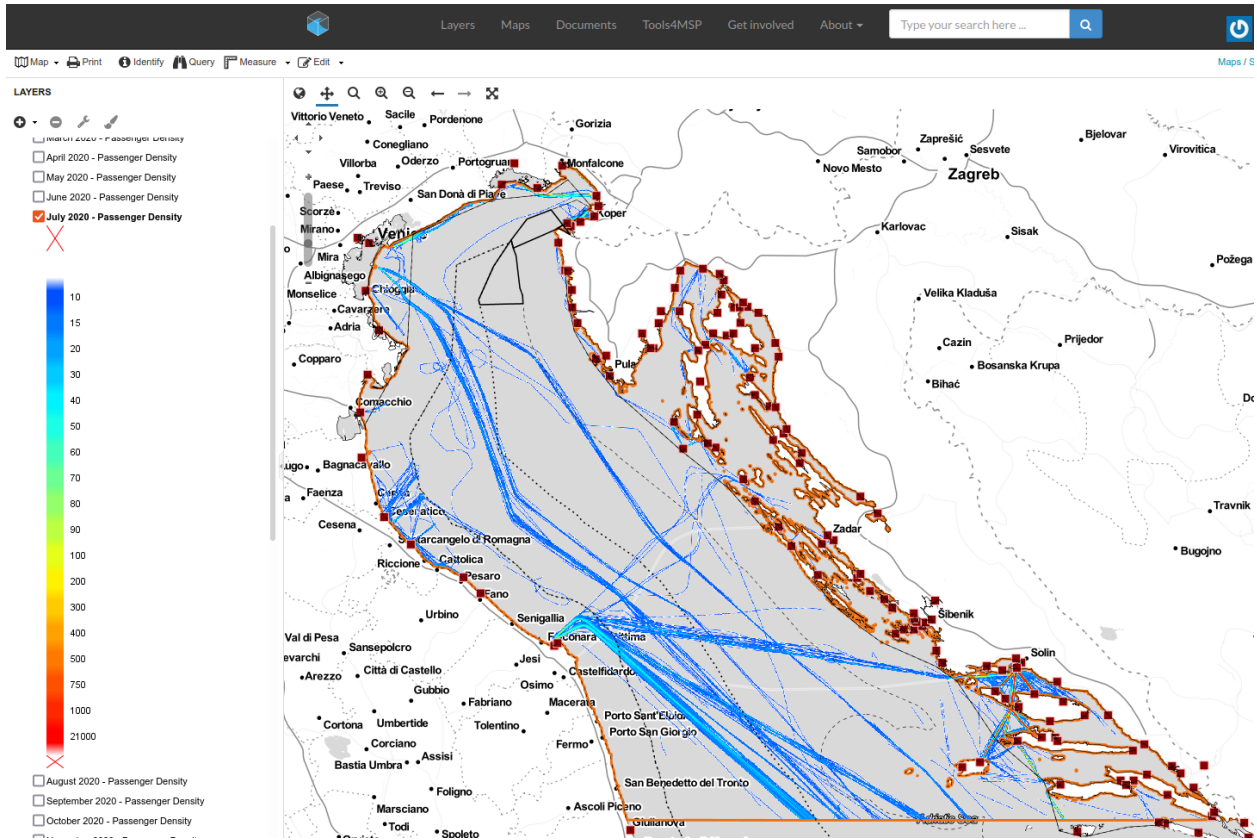


Figure 6. Passenger vessels trajectories, July 2020, and main ports.

3.2. Target species and areas

3.2.1. Marine mammals

The Northern and Central Adriatic sea hosts a population of the highest density of bottlenose dolphin (*Tursiops truncatus*) in the Mediterranean. Their habitats include coastal areas, open waters, lagoons and river deltas and estuaries. The northern Adriatic Sea has been recently designated as an Important Marine Mammal Area for bottlenose dolphins (IMMA, 2017) by the IUCN Marine Mammal Protected Areas Task Force (Notarbartolo di Sciara et al., 2016; UCN, 2018). Detailed information on the distribution of bottlenose dolphin comes from the aerial surveys conducted in 2010 and 2013 (Fortuna et al. 2015, 2018). Further details are in Soundscape Deliverable 5.4.1 *Report on mitigation measures and scenarios to reduce underwater noise and its effects on biological targets*.

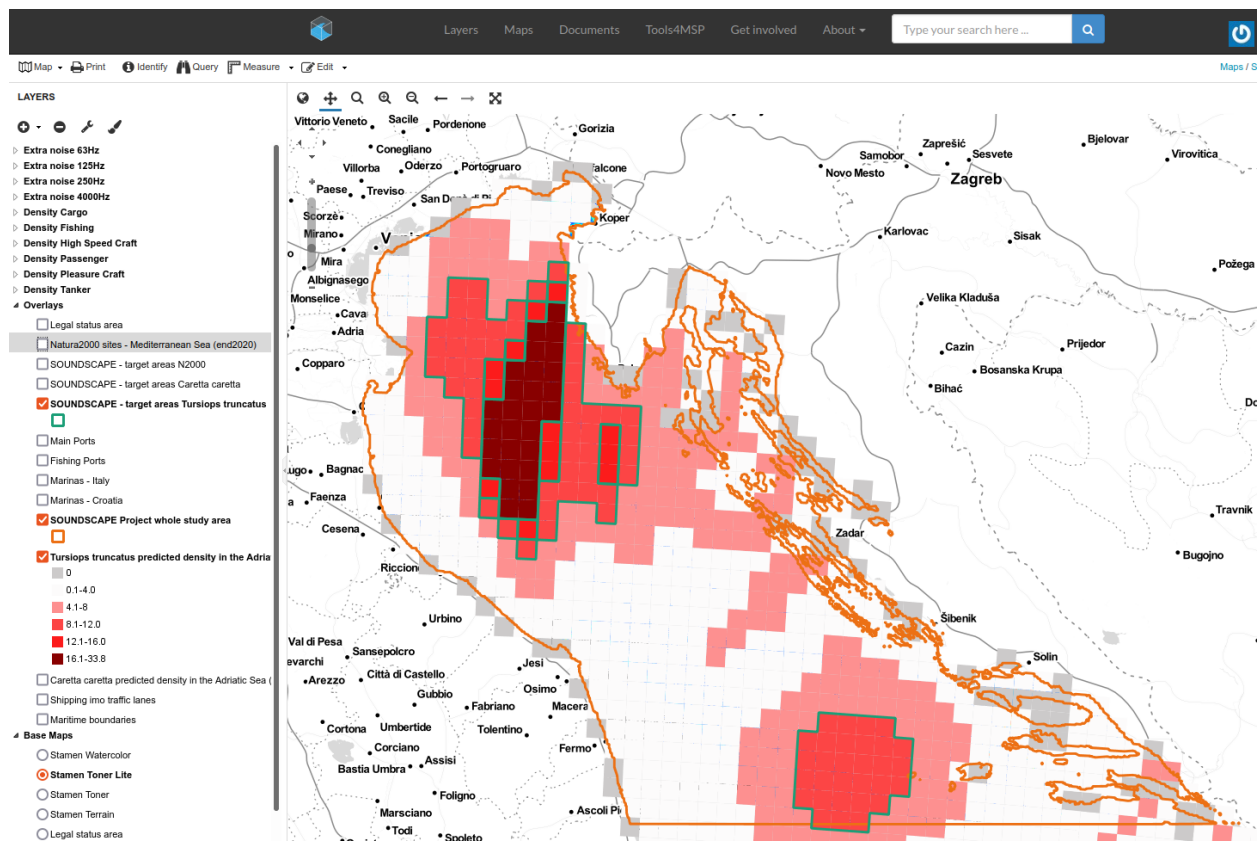


Figure 8. Predictability model of the density of bottlenose dolphins in the Adriatic Sea (Fortuna et al. 2018).

3.2.2. Marine turtles

Three species of sea turtles have also been reported in the Central and Northern Adriatic Sea (Fortuna et al. 2015; Lazar et al. 2008; Lazar et al. 2004a): loggerhead turtle (*Caretta caretta*), green turtle (*Chelonia mydas*, mainly present in the southern part) and the Leatherback turtle (*Dermochelys coriacea*), regular in the Mediterranean but with rare occurrence in the Adriatic Sea. Loggerhead turtle is the most abundant sea turtle specie in the Adriatic Sea. Spatio-temporal analysis indicates their whole-year presence within the Adriatic with strong seasonal variability in abundances and the existence of diverse habitats within this region. The loggerhead turtle distribution for the whole Adriatic Sea is based on the aerial survey data from 2010 and 2013 (Fortuna et al. 2018; Figure 9). Further details are in Soundscape Deliverable 5.4.1 Report on mitigation measures and scenarios to reduce underwater noise and its effects on biological targets.

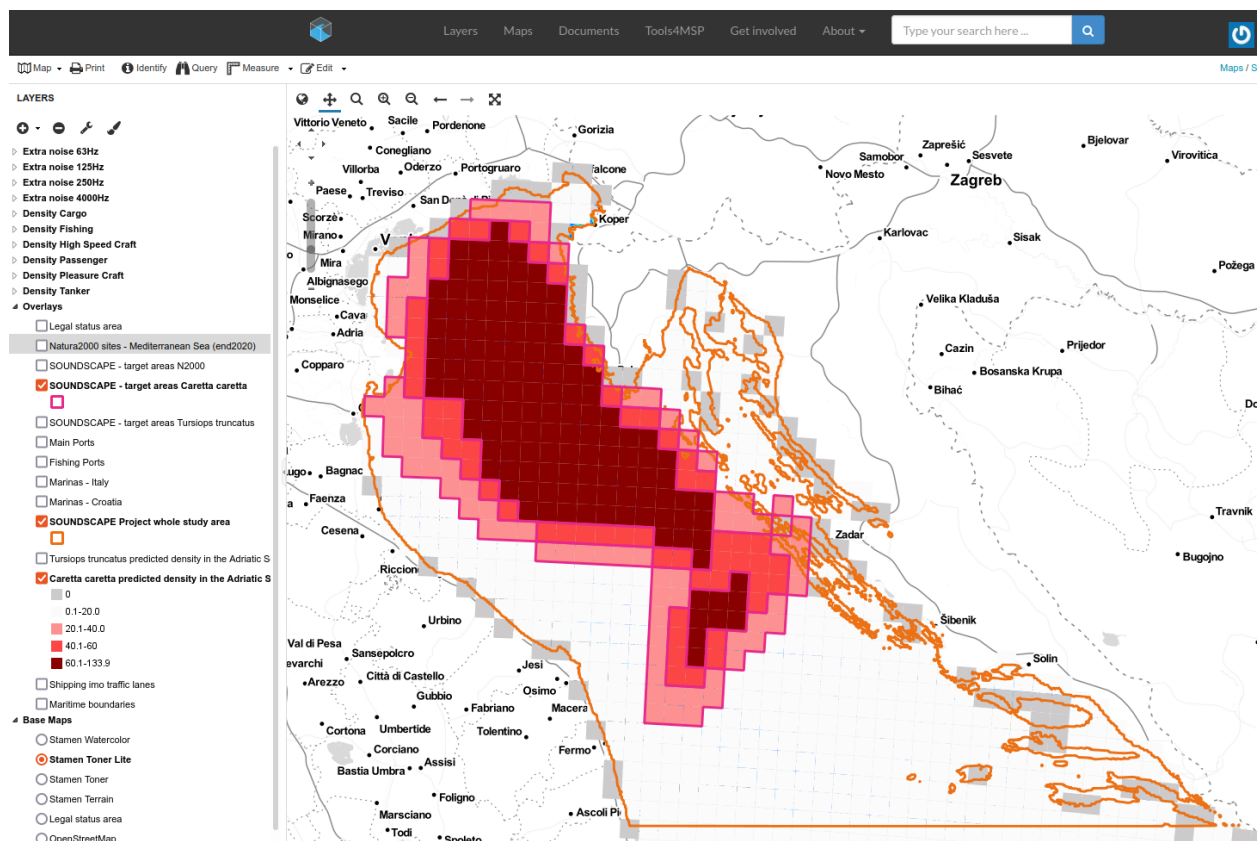


Figure 9. Predictive density of loggerhead turtle in the Adriatic Sea; Fortuna et al. 2018.

3.2.3. Marine protected areas

Natura 2000 is the key instrument to protect biodiversity in the European Union. It is an ecological network of protected areas, set up to ensure the survival of Europe's most valuable species and habitats. Natura 2000 is based on the 1979 Birds Directive and the 1992 Habitats Directive. Natura 2000 is an ecological network composed of sites designated under the Birds Directive (Special Protection Areas, SPAs) and the Habitats Directive (Sites of Community Importance, SCIs, and Special Areas of Conservation, SACs).

The European database on Natura 2000 sites consists of a compilation of the data submitted by Member States to the European Commission. This European database is generally updated once per year, so as to take into account any updating of the content of the national databases by Member States. However, the release of a new EU-wide database does not necessarily entail that a particular national dataset has recently been updated.

The descriptive data in the European database are based on the information that national authorities have submitted, for each of the Natura 2000 sites, through a site-specific standard data form (SDF). Amongst other site-specific information, the standard data form provides the list of all species and habitat types for which a site is officially designated. The SOUNDSCAPE 5.3.1 map includes the Natura 2000 geodatabase covering the reporting in 2020.

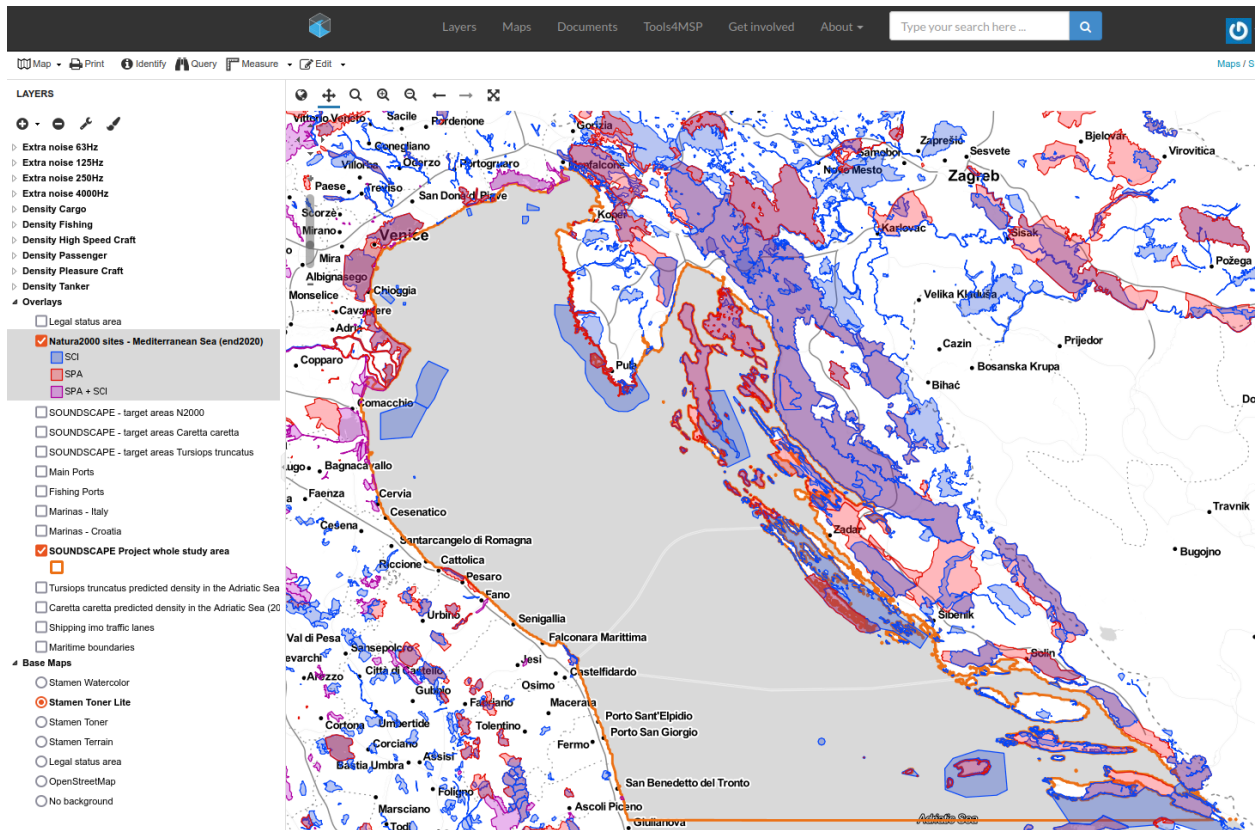


Figure 10. Natura 2000 areas.

3.3. Environmental data

Environmental data used for Soundscape modelling have been included in the geodatabase. In details, the input data for 5.2 modelling activities are:

- Bathymetry, provided by EMODNET database (<https://emodnet.ec.europa.eu/en>).
- Sediment composition, provided by EMODNET database and integrated with NAVO data
- Temperature and Salinity, provided by CNR-ISMAR using data from TIRESIAS forecast system, based on SHYFEM hydrodynamical model. The values are daily averaged values on the whole domain with spatial resolution around 1 km and vertical resolution in 32 z levels from 0 to 1100 m
- Wind, provided by CNR-ISMAR in the framework of TIRESIAS forecast system. The values are the most frequent value in the day in each cell on the whole domain with spatial resolution around 1 km.

Further details are in Soundscape Deliverable *D.5.2.1 Monthly and annual Maps of soundscape.*

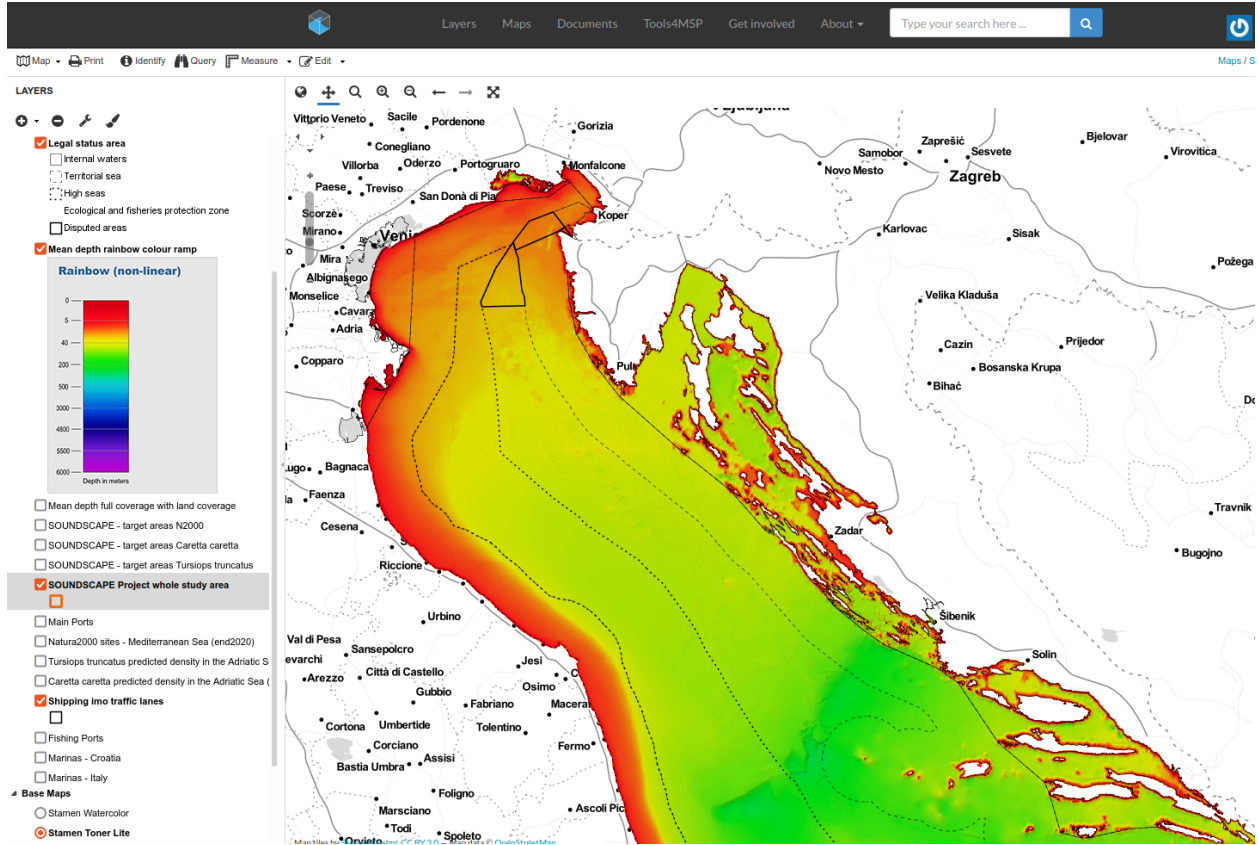


Figure 11. EMODnet Bathymetry mean depth based on source resolution of 1/16 arc minute (~125 meter). Ocean overlay without land cover in rainbow (multi) colour ramp style..

4. Noise assessments

4.1. Baseline Noise Levels mean maps

Baseline Noise Levels maps (expressed in dB ref 1 μ Pa² 1/3 octave) have been modelled within SOUNDSCAPE Activity 5.2 (see related reports for further details on modelling and calibration). The monthly estimated means, for the entire water column (EWC) and all the 4 considered frequencies (63, 125, 250 and 4000 Hz), maps and related statistics have been calculated in order to better describe the noise levels condition of the whole Central-Northern Adriatic Sea during the 2020. Further details are in Soundscape Deliverable 5.4.1 *Report on mitigation measures and scenarios to reduce underwater noise and its effects on biological targets*.

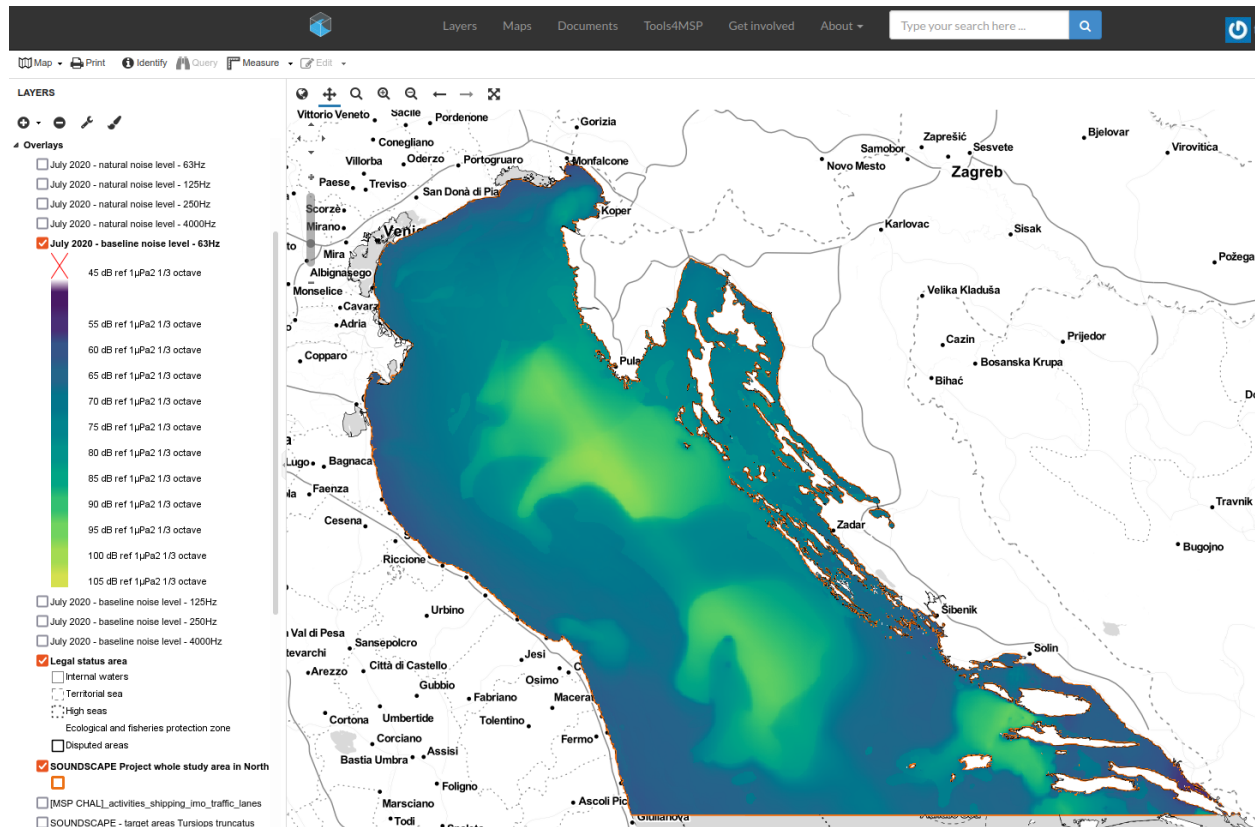


Figure 12. Baseline Noise Levels maps (July 2020; 63Hz; dB ref 1 μ Pa² 1/3 octave).

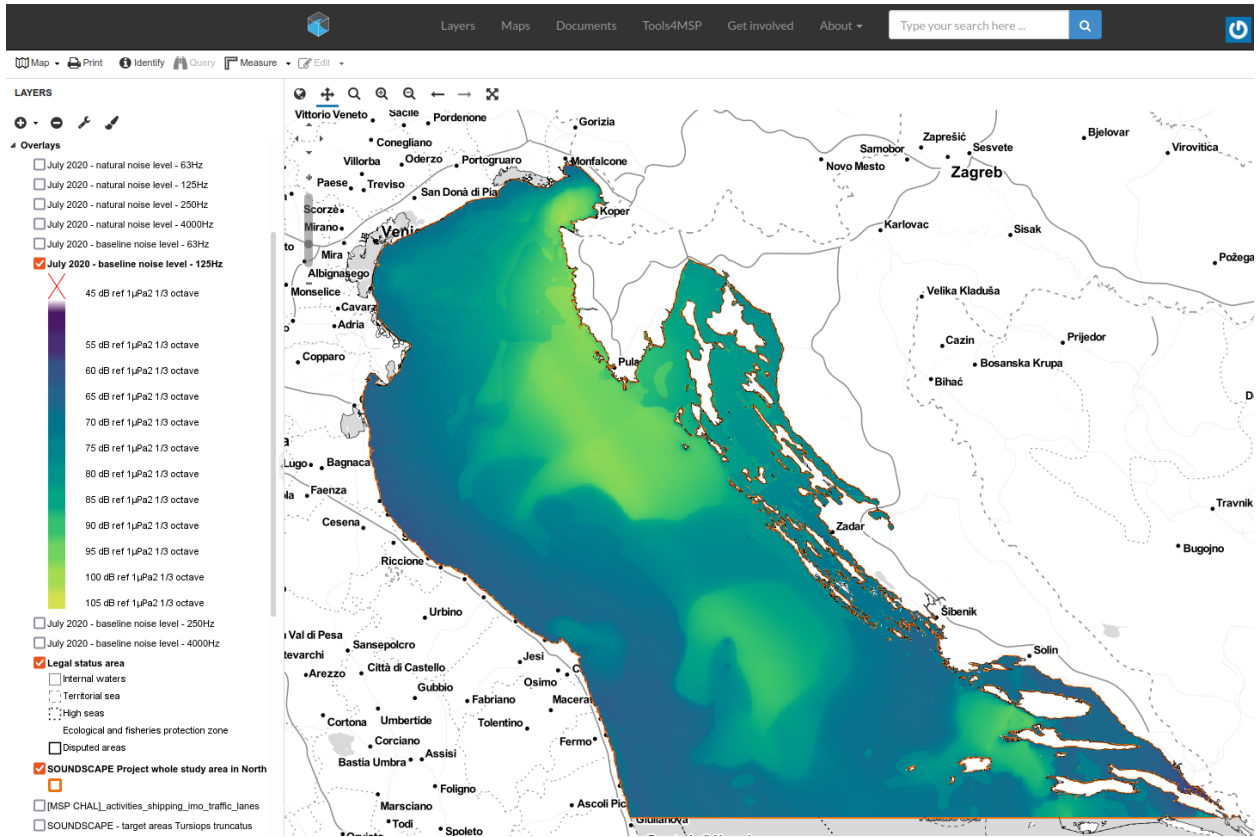


Figure 13. Baseline Noise Levels maps (July 2020; 125Hz; dB ref 1μPa2 1/3 octave).

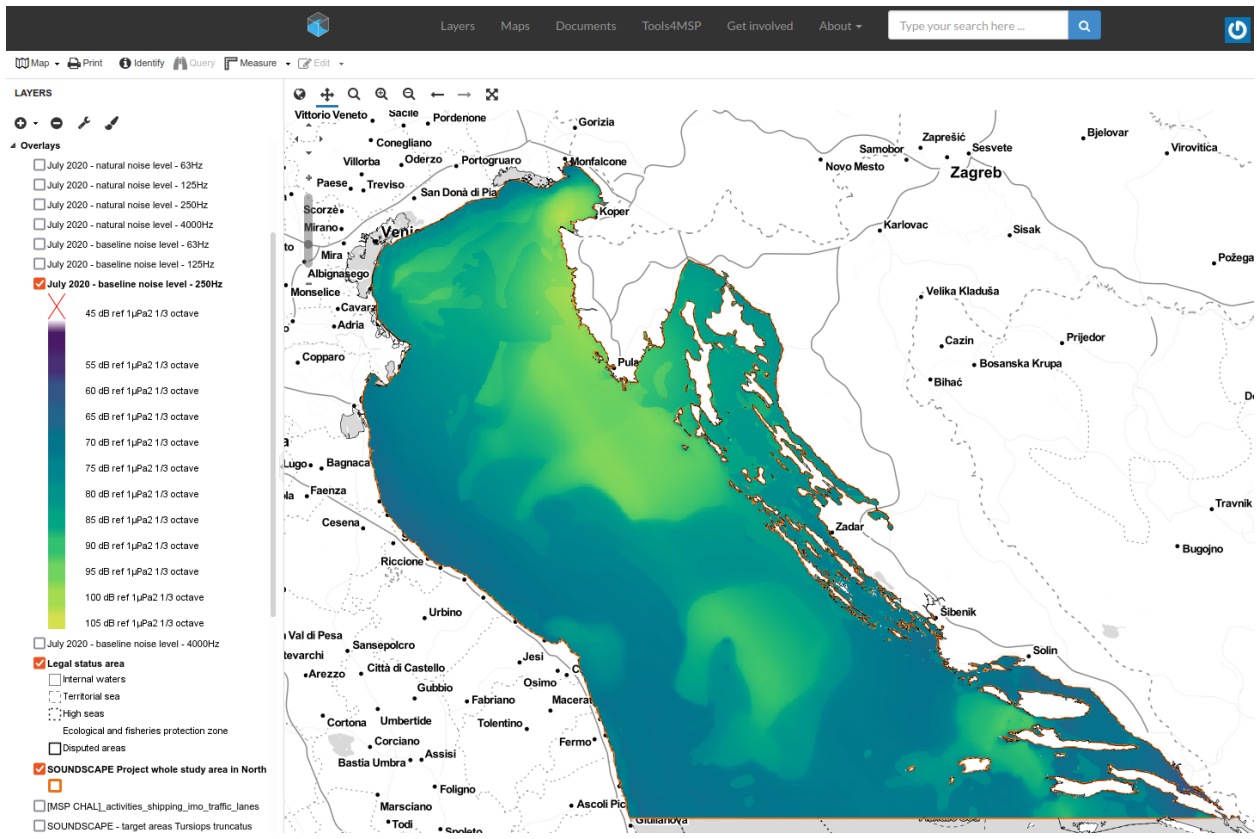


Figure 14. Baseline Noise Levels maps (July 2020; 250Hz; dB ref 1µPa2 1/3 octave).

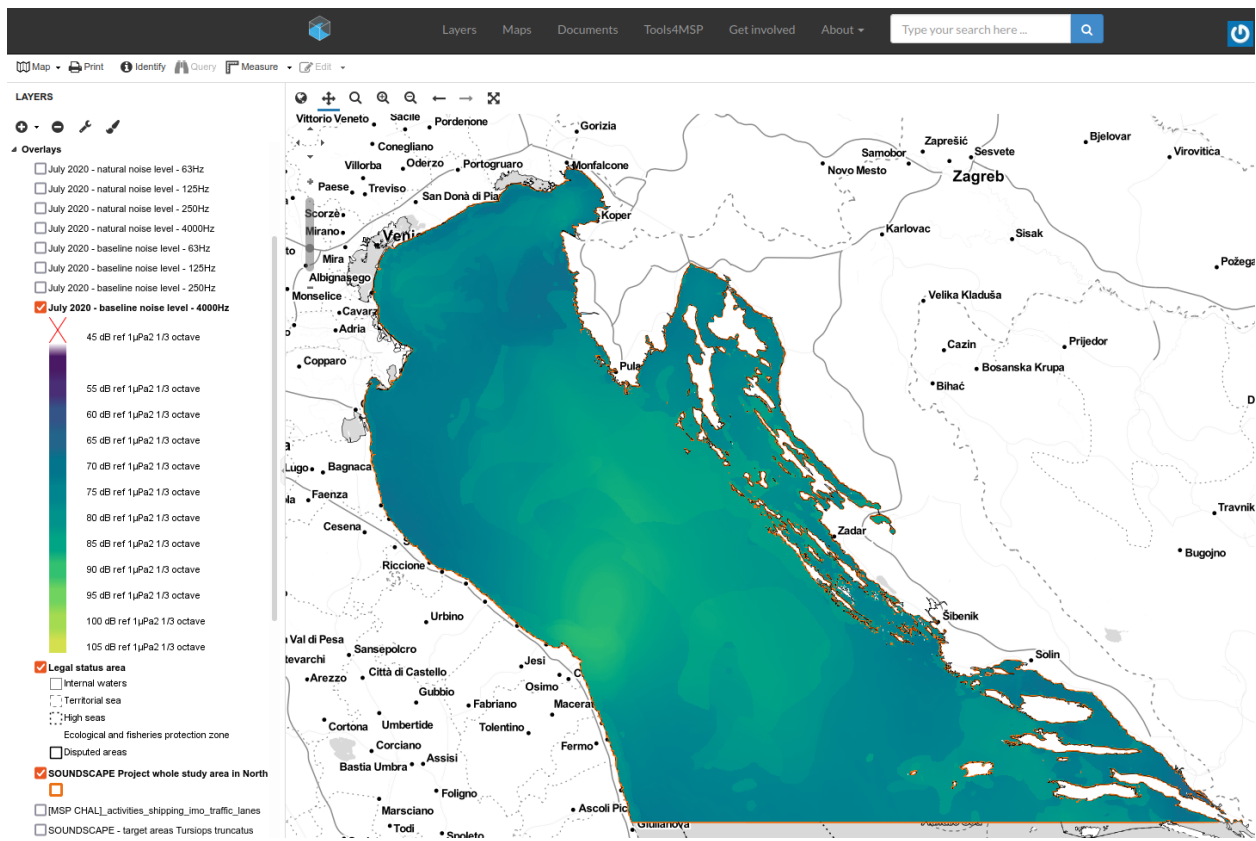


Figure 15. Baseline Noise Levels maps (July 2020; 4000Hz; dB ref 1 μ Pa₂ 1/3 octave).

4.2. Natural Noise Levels mean maps

Natural Noise Levels maps (expressed in dB ref 1 μ Pa₂ 1/3 octave) have been modelled within SOUNDSCAPE Activity 5.2 (see related reports for further details on modelling and calibration). The monthly estimated means, for the entire water column (EWC) and all the 4 considered frequencies (63, 125, 250 and 4000 Hz), maps and related statistics have been calculated in order to better describe the noise levels condition of the whole Central-Northern Adriatic Sea during the 2020. Further details are in Soundscape Deliverable 5.4.1 *Report on mitigation measures and scenarios to reduce underwater noise and its effects on biological targets*.

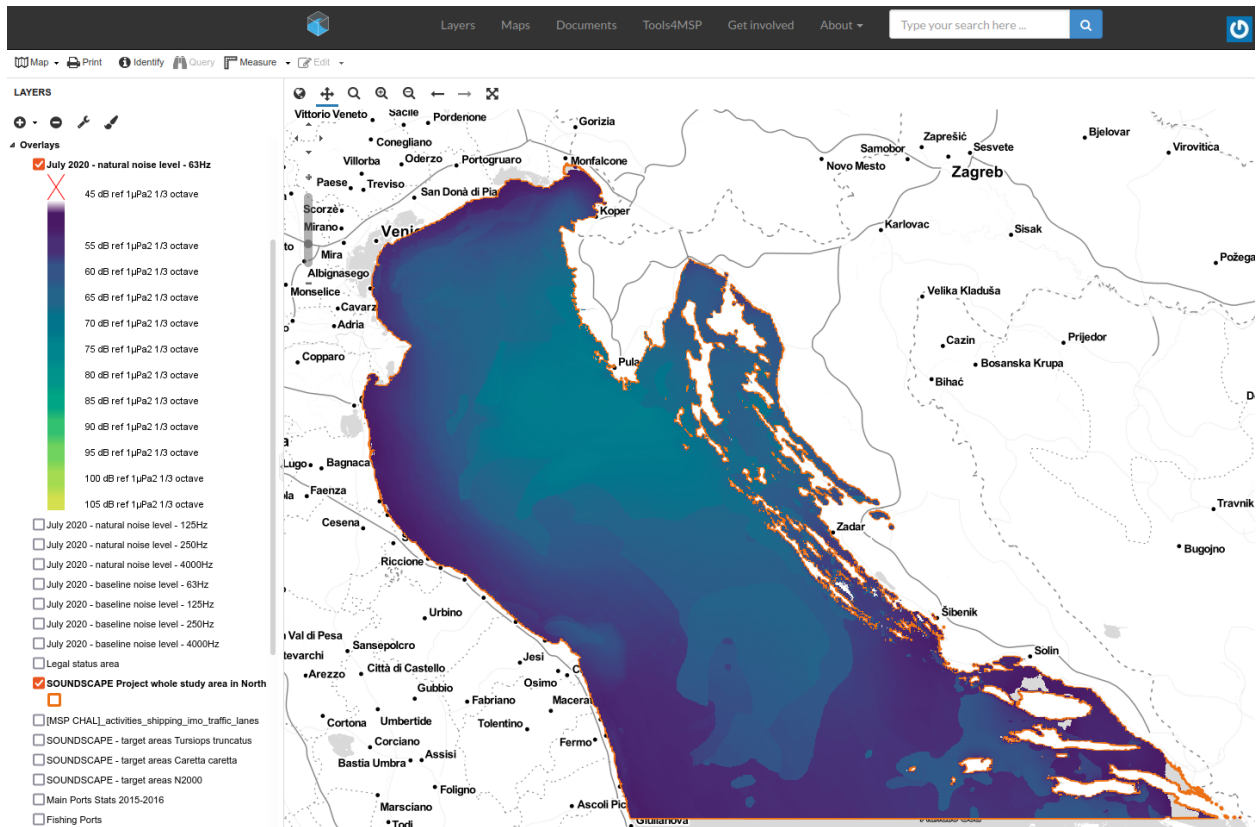


Figure 16. Natural Noise Levels maps (July 2020; 63Hz; dB ref 1 μ Pa2 1/3 octave).

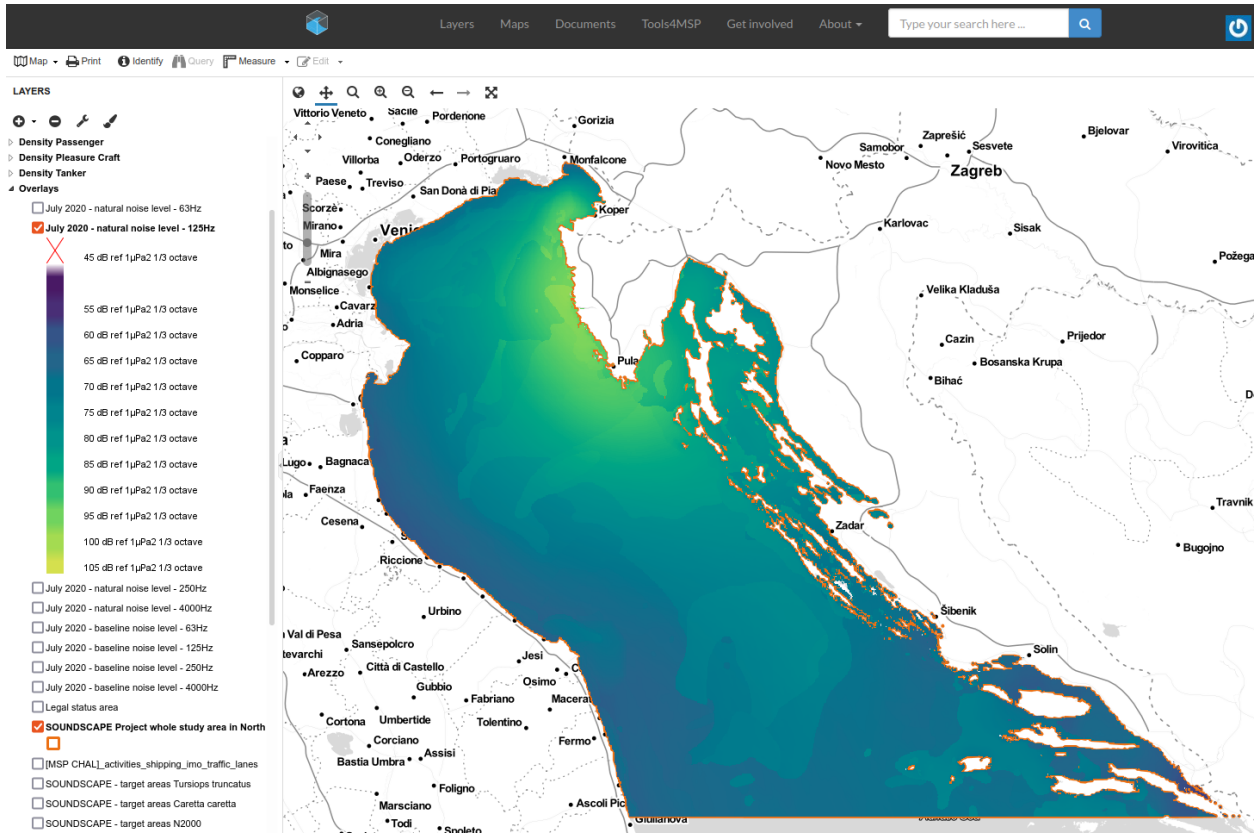


Figure 17. Natural Noise Levels maps (July 2020; 125 Hz; dB ref 1 μ Pa2 1/3 octave).

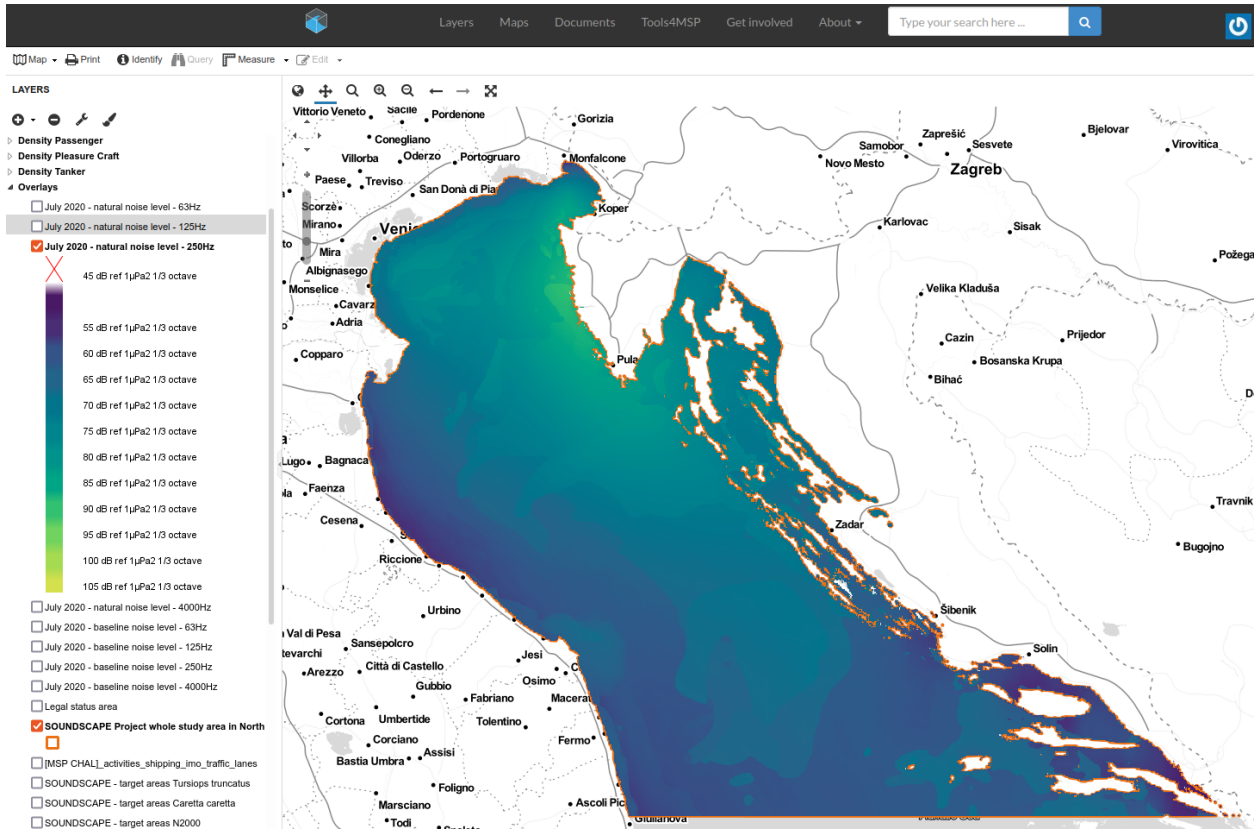


Figure 18. Natural Noise Levels maps (July 2020; 250Hz; dB ref 1 μ Pa² 1/3 octave).

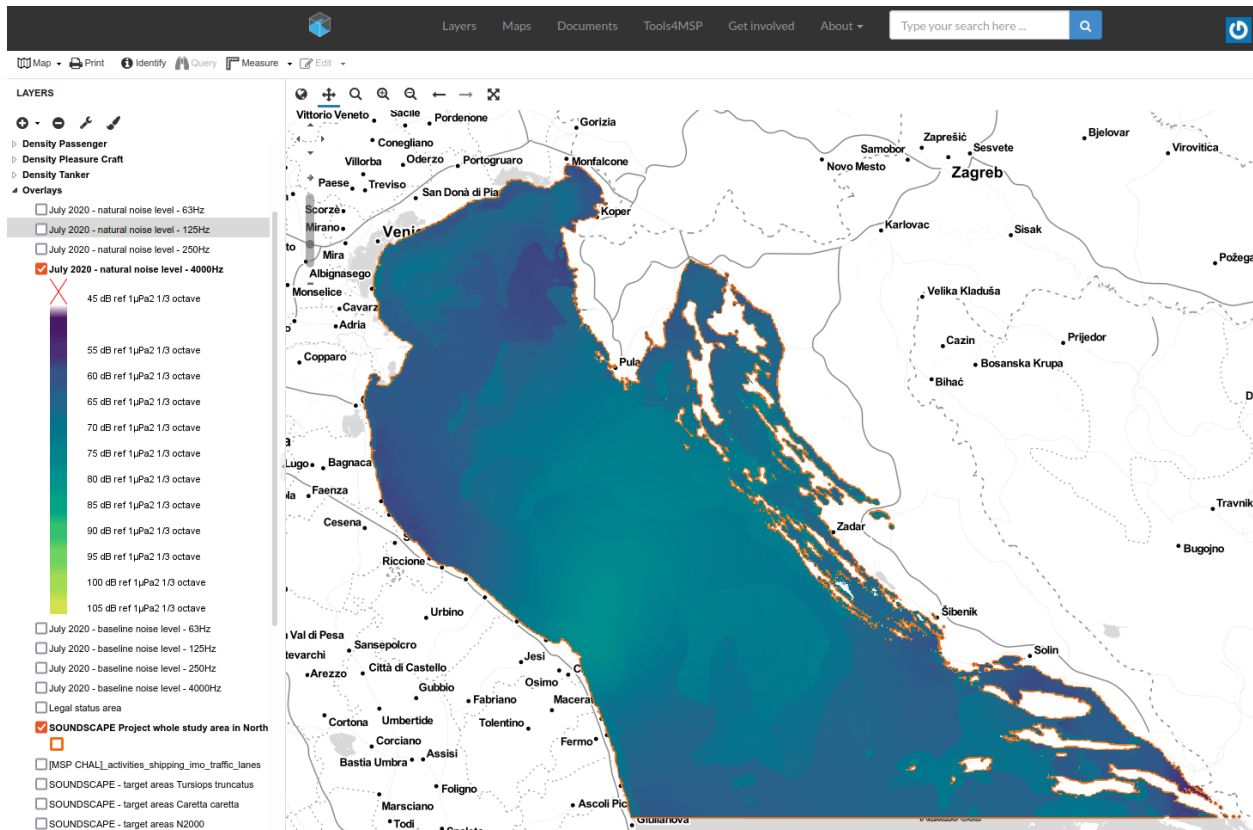


Figure 19. Natural Noise Levels maps (July 2020; 4000Hz; dB ref 1 μ Pa² 1/3 octave).

4.3. Extra noise

The methodology for the analysis of the soundscape maps was developed with a step-by-step workflow with the primary objective of determining which are the areas of attention for the excess levels of anthropogenic noise in the north-central Adriatic. This “noise attention assessment” workflow is based on “extra noise” maps. Difference between the mean of baselines [Nm(baseline) - i.e. Current conditions] and the mean of naturals [Nm(natural) i.e. Reference conditions] for each grid cell, expressed in dB, for each representative frequency and month. Further details are in Soundscape Deliverable 5.4.1 *Report on mitigation measures and scenarios to reduce underwater noise and its effects on biological targets*.

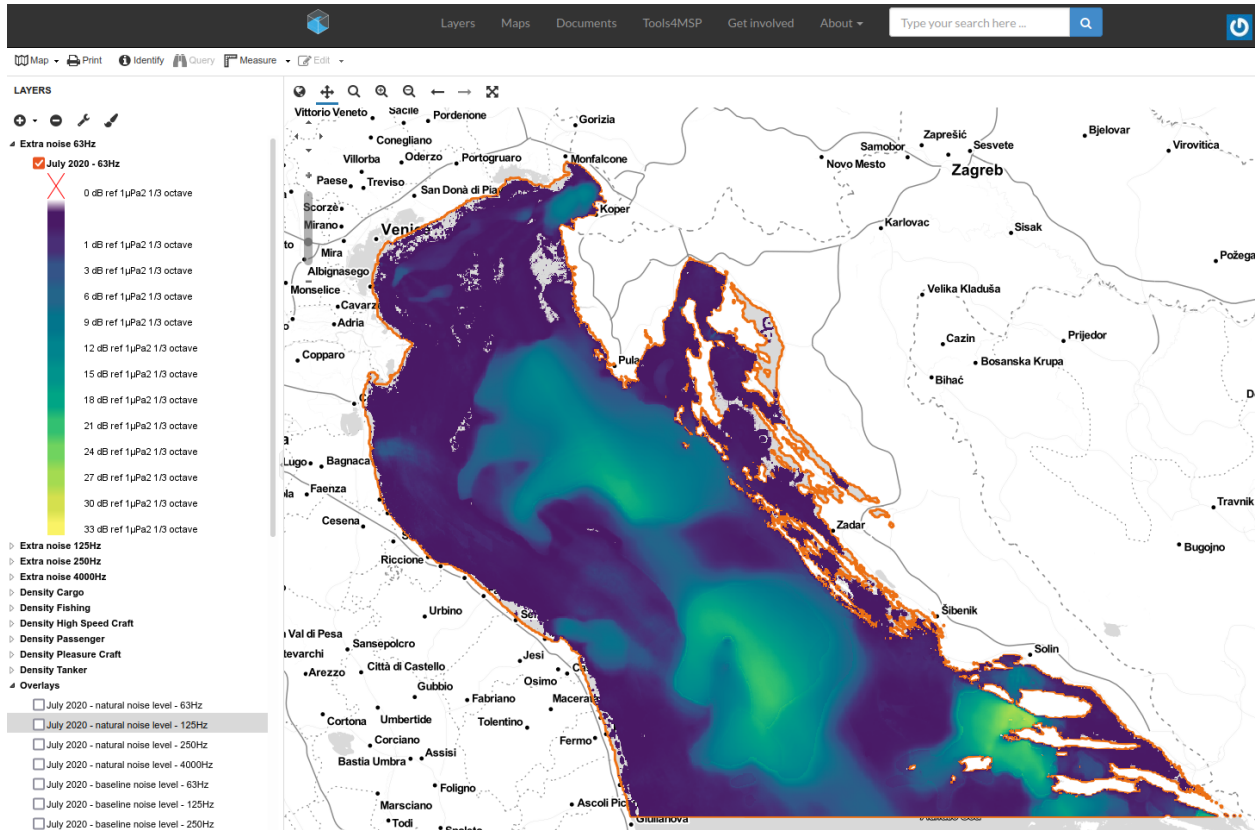


Figure 20. Extra Noise Levels maps (July 2020; 63Hz; dB ref 1µPa2 1/3 octave).

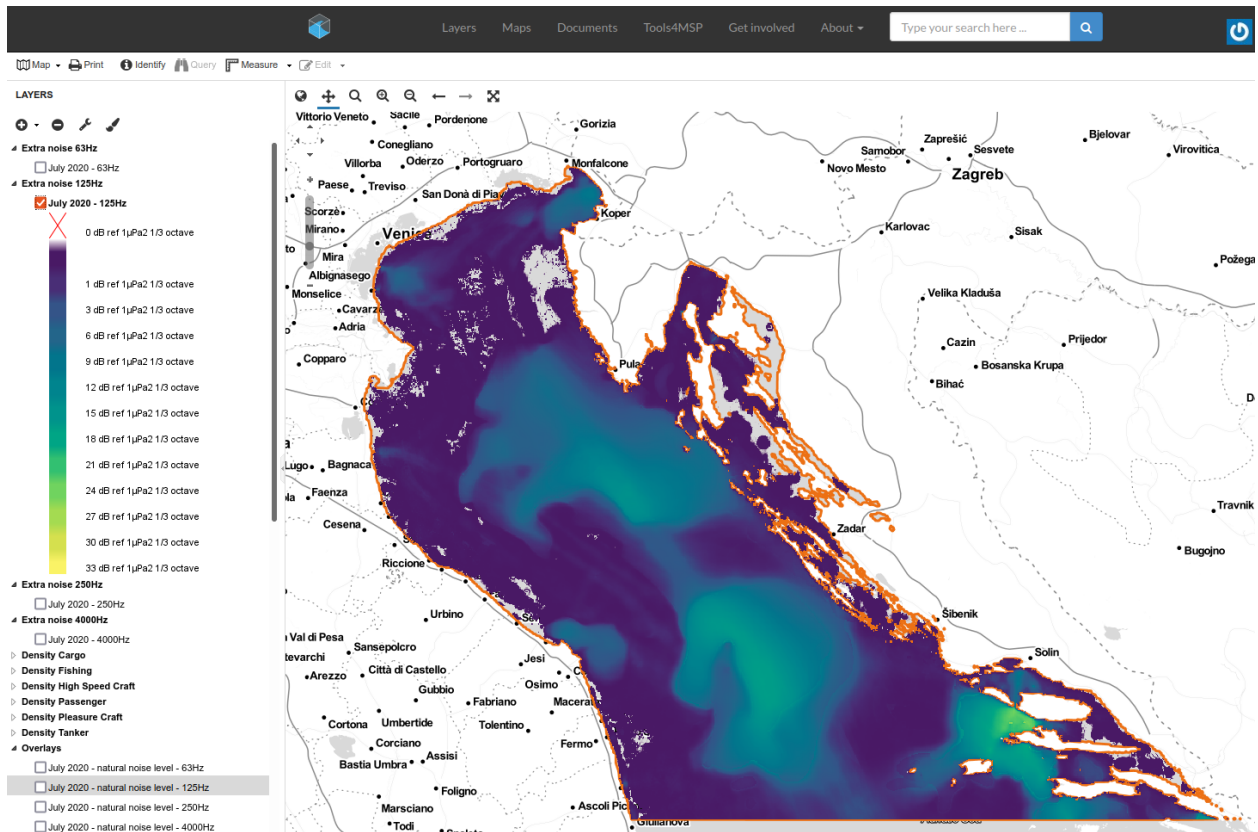


Figure 21. Extra Noise Levels maps (July 2020; 125Hz; dB ref 1 μ Pa2 1/3 octave).

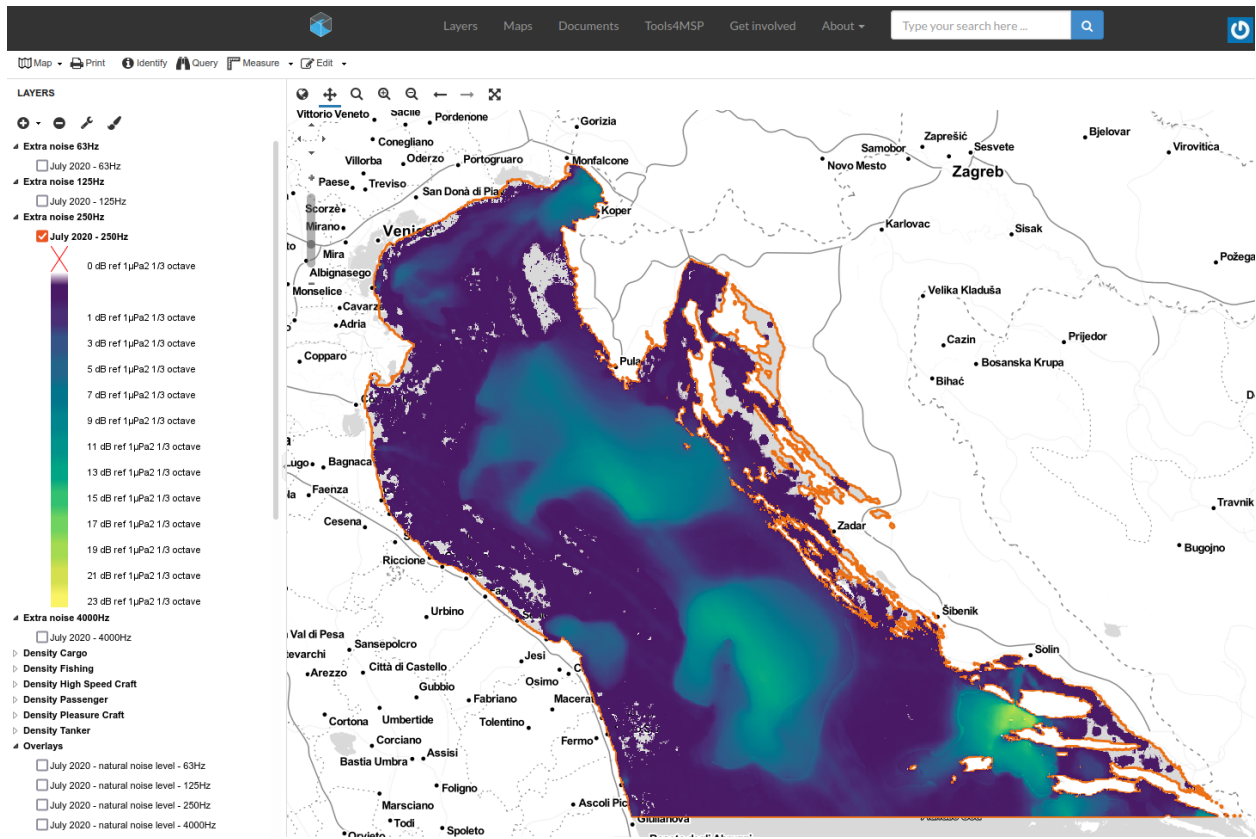


Figure 22. Extra Noise Levels maps (July 2020; 250Hz; dB ref 1μPa2 1/3 octave).

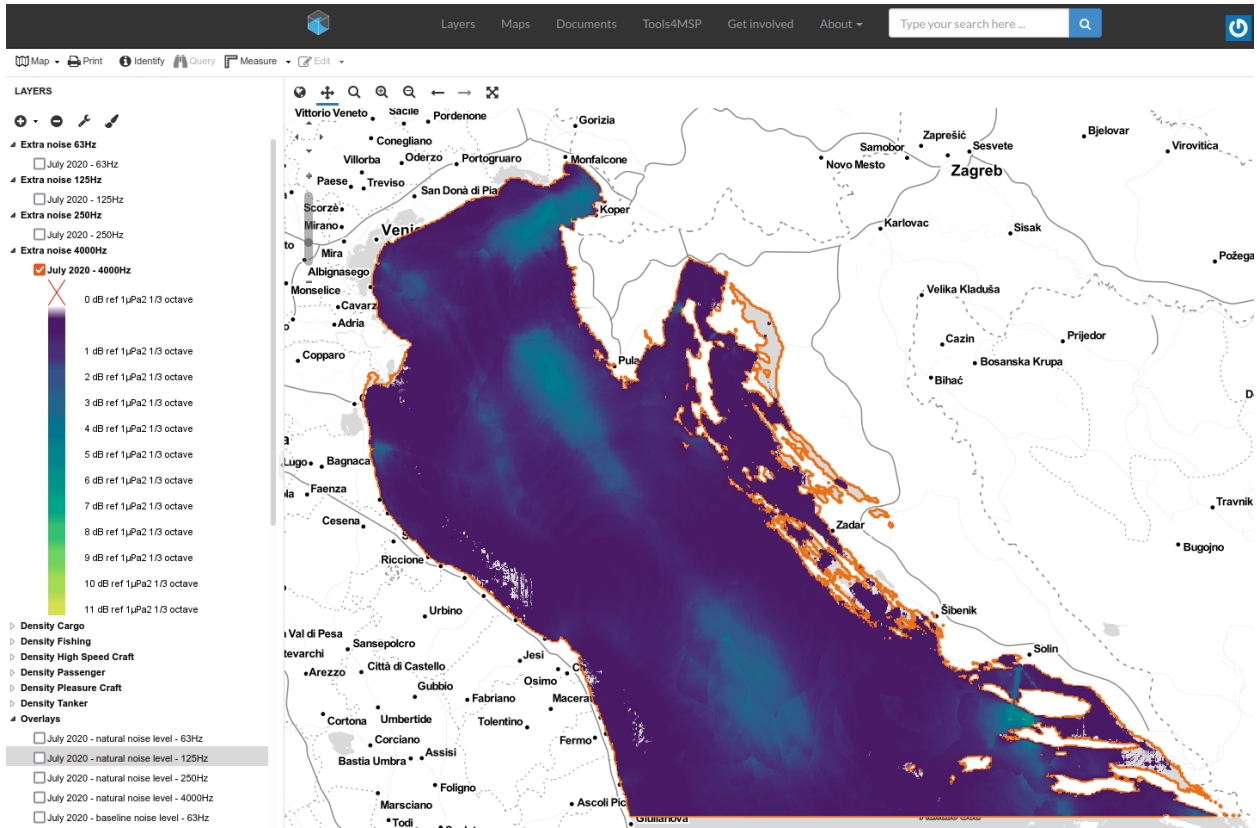


Figure 23. Extra Noise Levels maps (July 2020; 4000Hz; dB ref 1 μ Pa₂ 1/3 octave).

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