The 5th E-newsletter of the TIMMOD Project

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TIMMOD PROGRESS

In the fifth quarter edition of TIMMOD electronic Newsletter you can read about the project activities implemented in the period from September 2021 until January 2022:

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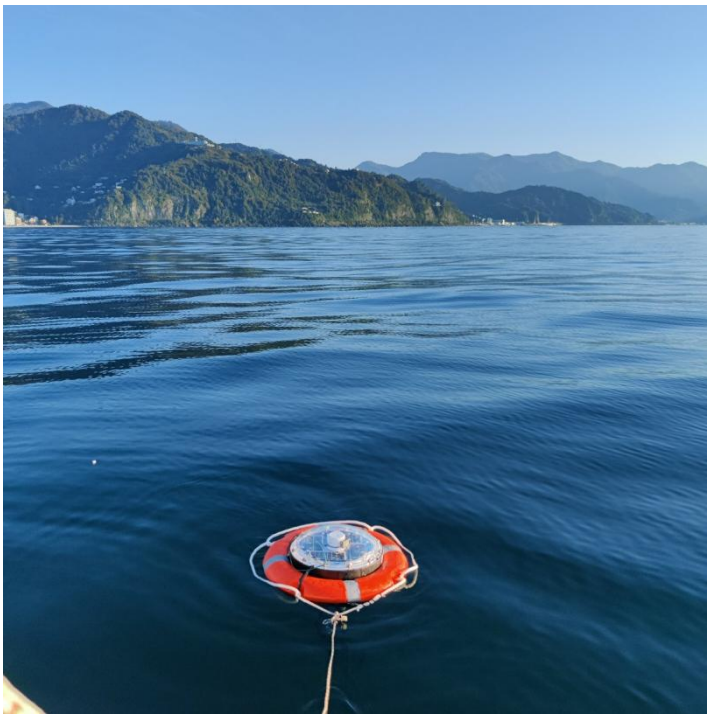
TIMMOD Sea survey and pilot demonstration project in the coastal area of Georgian Black Sea.

Starting from the 11th till the 25th of October 2021, the National Environment Agency of the Ministry of Environment and Agriculture of Georgia has implemented an important 2-week 2nd Pilot Demonstration Tests, Training and Marine Surveys using Innovative Monitoring Equipment in the Batumi-Gonio Bay.

NEA, with the financial support of the European Union within the Black Sea Basin Joint Operational Programme 2014-2020, has purchased a portable water-based CTD buoy platform that is an independent system, first located in the Black Sea of Georgia and designed to monitor water quality. The device will measure three main marine parameters: water el. Conductivity, temperature and depth, online via GPRS communication, and continuously share data to the Project Partners. Demonstrations and trainings also included Biological and Chemical Sampling Surveys with Multi-sensor water-quality probe, BioSonics Echosounder Hydroacoustic data collection for fish assessment, Sealion2 Survey, trawling and sample collection, the ICT modelling/forecasting and GIS tools.

Despite the challenges due to the COVID-19, experts from TIMMOD project partners, AUTh and DDNI, successfully arrived in Georgia and alongside with the NEA top management and Deputy Minister of Environment and Agriculture, participated in the survey. Facing several challenges like bad weather conditions and exploration of unknown devices the team successfully completed all tasks included in the survey programme.

“It is noteworthy that, within the framework of the same project, Georgian specialists were able to participate in various international practical training or seminars, which helps to strengthen their capabilities"- said the Deputy Minister of Environment and Agriculture, Nino Tandilashvili.



The Marine Surveys were organized and hosted by the National Environment Agency, who provided the research vessel and the set of advanced monitoring sensors and instruments in Batumi, Georgia.

The main objectives of the demonstration survey were achieved, providing an excellent basis for further implementation of the TIMMOD work plan.

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TIMMOD INNOVATION STRATEGY.

Promoting technology innovations is the main focus of TIMMOD activities. Combining the efforts of all project partners an Innovation Strategy for further adoption and implementation of innovative environmental monitoring methodologies and tools has been developed.

The Innovation Strategy is designed to bring together national, regional, EU policies and regulations, combined with new monitoring and information technology, expanded transparency, and innovative enforcement.

National discussion and validation workshops addressed to key stakeholders in the water monitoring sector are planned for the first quarter of 2022. The workshops will take place in all project partner countries having the final international strategy validation in Romania.

The **Vision** that defines the current Strategy is to make Black Sea cleaner, to increase fish abundance, and provide sustainable use of fish and non-fish resources by using advanced monitoring and modeling tools. It is shortly expressed in the slogan of TIMMOD project:

Innovation we need,
for the Black Sea we want!

The analyses, conclusions and recommendations drafted in the Strategy are primarily intended to draw efforts of TIMMOD partners toward the involvement of key national stakeholders in the discussions during National Validation Workshops, and most important – in the implementation of this Strategy in short-term and long-term prospective.

In the same time most of the main conclusions can be widely used by researchers, surveyors, decision makers, as well as by a wider range of public institutions, industry companies and the general public.

The final draft version of the Strategy will take into account all considerations and recommendations from stakeholders and feedback from the 5 National validation workshops. It will be discussed and approved at the final International Validation Meeting, after which the final document, the Innovation Strategy, will be published and disseminated.

If you are interested to be part of this process please join our **TIMMOD community** expressing your will by e-mail (*contact details are available on the last page of E-Newsletter*).

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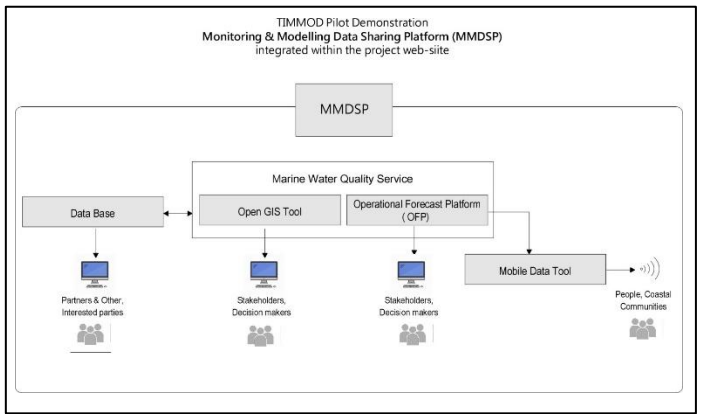
Launching of TIMMOD ICT Tools

One of the key results of the TIMMOD project implementation is a set of ICT tools for data handling and numerical modelling of the marine environment, including high-level implementation of ocean dynamics modelling, and development of web-based data tools. The base ICT tool is a web-GIS platform integrated in the TIMMOD pilot demonstration Monitoring and Modelling Data Sharing Platform (MMDSP) on the project website: www.timmod.org.

The web-GIS tool presents a modern solution for handling and sharing three types of data:

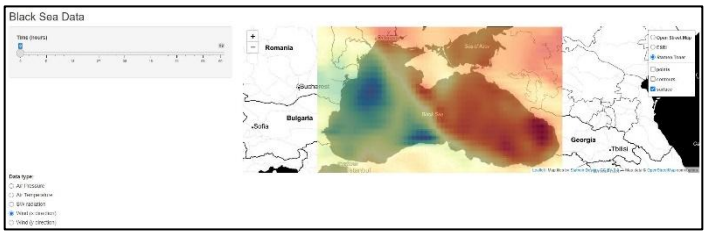
- Hydrodynamic and meteorological data (sea currents, salinity, temperature, wind).
- Ecological data (biological, chemical, and physical parameters of seawater).
- Data of fish and non-fish stocks.

The conceptual schematics of the pilot MMDSP in TIMMOD Project, showing the relation of the primary Database, the GIS tool, and the Operational Forecast Platform (OFP) of modelling components (Delft3D + MIKE Eco-Lab fed by Copernicus and NOAA/ECMWF services) towards dissemination and alert tools (Mobile Data Tool) to the public is presented below.



The forecasting of several marine environmental parameters in two coastal areas around – Varna in Bulgaria and Batumi in Georgia - is accomplished by using complex datasets feeding and forcing the models' setups by proper meteorological input (by NOAA/ECMWF) and oceanographic boundary conditions (by Copernicus) about the local hydrodynamics.

The atmospheric forcing input configuration that feeds the TIMMOD operational simulations of sub-mesoscale hydrodynamic circulation is post-processed and reproduced within the entire study area's domain of the Black Sea Basin; examples of wind speed raster fields in contour surface maps is provided below, link https://timmodproj.shinyapps.io/Black_Sea/.



The completed Deliverable D.T2.1.1 "*Web-based open GIS tool for implementation of modelled data by stakeholders and end-users, including a database of hydro-environmental monitoring and modelling output and future projections*" presents in detail the way to build and setup a novel GIS technology component of complex data dissemination based on: Quantum Geographical Information System (QGIS; https://www.qgis.org) for desk management; *R Studio* script libraries; *rgeos* Interface to Geometry Engine - Open Source ('GEOS'), using *C* 'API' for topology operations on geometries; *Shiny* a new *R Studio* app with easy interactive web applications (shiny.rstudio.com); *Leaflet* (https://leafletjs.com/) technology.

An example of a) raster fields for BSB seawater Sea Surface Salinity (SSS) and Temperature (SST) with contour surface maps (upper graph), and b) vertical

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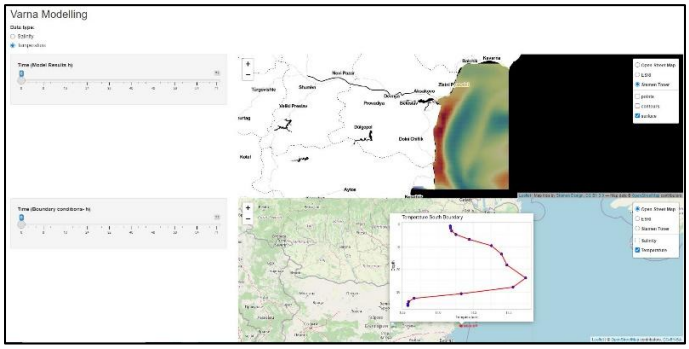
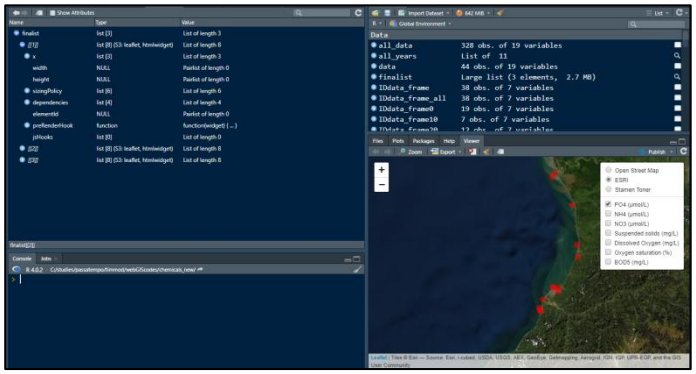
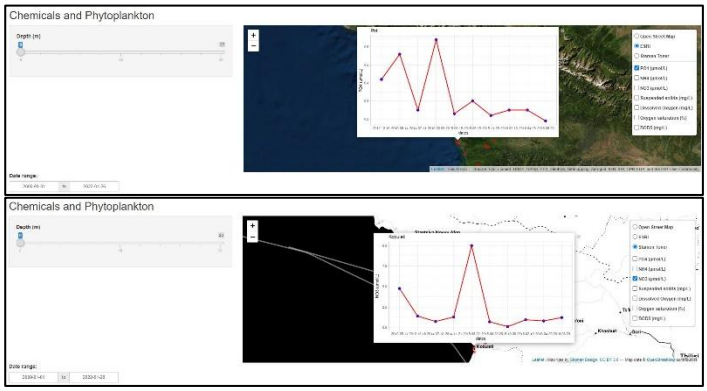
distributions over the water column on points along the computational domain boundaries (lower graph), in the Varna coastal area (*pilot test case in Bulgarian waters*), produced within the TIMMOD OFP for oceanographic modelling, is given below (link: https://timmodproj.shinyapps.io/web_map_Varna/?fbclid=IwAR0IWNRpE4D_MWv0Es6xd3qNJuXaFkguGy0isswG5Sx_VQ-EUg1ahJavv6g).



The programming codes and building process within the *R Studio* working interface, e.g., arranging *lists* and relevant data structures in order to group GIS maps, created in *Leaflet*, are shown in the "*Viewer*" panel below; application refers to the coastal stations of field monitoring data in the Batumi pilot test within TIMMOD project.

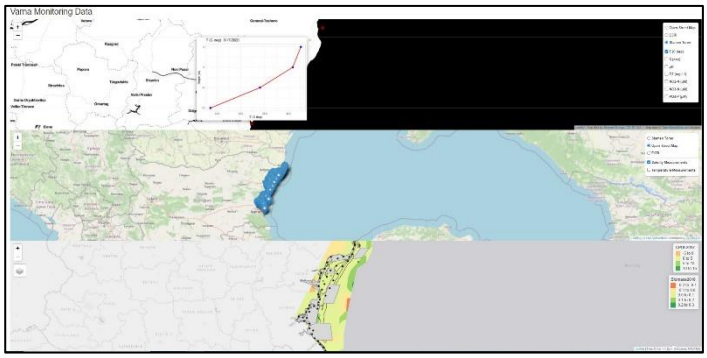


This processing results to the following depiction outcome about Chemical and Phytoplankton parameters (PO_4 and NO_3 concentrations' timeseries are shown here) in the Batumi coastal area's part of the web-GIS app, supported in terms of dataset feeding by the TIMMOD Survey Pilot Demonstrations (link: https://timmodproj.shinyapps.io/web-GIS/?_ga=2.156544819.962552367.1638198068-1362765819.1638198068&fbclid=IwAR0Hxq8h7Gr1P7UsMkciH2E_enn8wMFkGn9uSLBu_e6f82UF1j3yuXvqW-s).



For the Varna pilot test site, the TIMMOD web-GIS app offers the following monitoring field georeferenced datasets (see Figure below):

a) dual map representation of physicochemical datasets, b) abundance of Turbot fish stock by Catch Per Unit Effort (CPUE; kg/km^2) in raster mode for 2017, c) vertical (along the water column) distribution of e.g., pH and other physicochemical parameters in selected field measurement points, d) SSS and SST point values, e) spatial polygons and spatial points projected for Rapana Venosa fields and Natura2000 areas.



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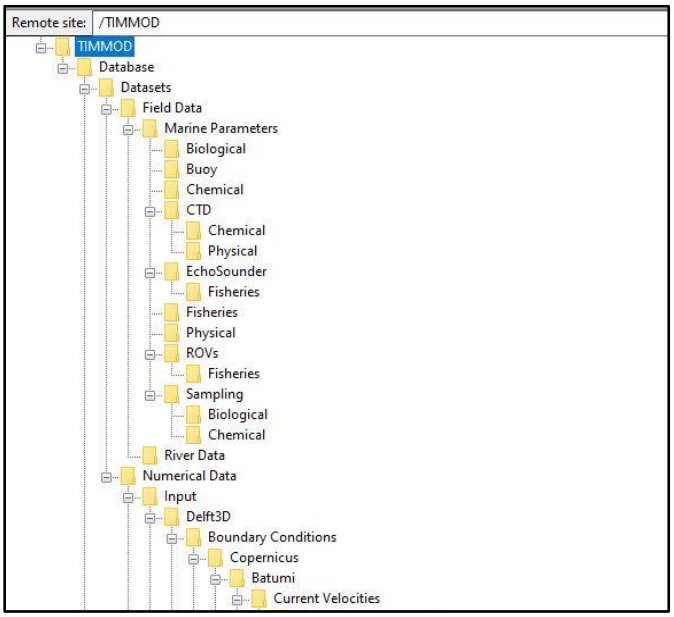
All the above are found via:

https://timmodproj.shinyapps.io/Varna_new/?fbclid=IwAR2JFq1xHhIs8NsO6Wm6uRTje0VVoWYGrRzi62MsAkea79pcUKRe5X9wTMM

Supplementary to the web-GIS platform, a Database has also been created to support the interactive web-based platform of the TIMMOD Project. The Database is the 4th essential tool of the MMDSP within TIMMOD Project for the dissemination of hydro-environmental monitoring and modelling output (including forecasts). The Database tool is provided via the link: http://timmod.org/index.php/en/ict-tools/timmod-data-bas. It combines several types of parameters, including hydrodynamic and meteorological data, ecological data in coastal areas, and fish and non-fish stock data.



As a means to assist the data-sharing processes between the members of TIMMOD project in the following, login info of the created FTP repository, called *marineftp* in AUTh's mini-cluster infrastructure.

The open-source freely available *FileZilla* FTP client software can be downloaded from the link https://filezilla-project.org/ in order to establish connection to and management of the TIMMOD FTP repository/database. The aforementioned way to connect and manage the proposed database, based on the respective software, hinges on the choice to secure data, e.g., from cyber-attacks to freely available FTPs and its versatility/easy-use in the communication of Windows- and Linux-based O/S machines.

In the respective folders, the shared material by all TIMMOD PPs is concurrently uploaded, in unified formats, i.e., .dat, .csv, .xlsx, .tif, .shp, etc. files, from modelling input/output and monitoring results from the demonstration pilot surveys in Varna and Batumi. Other historically available datasets about river discharges, etc. are also uploaded there.

To secure interaction stakeholders and end-users are provided with editorial rights to the FTP repository, and they are informed to provide georeferenced files and information for any kind of datasets one may upload.

The information for *FileZilla* login/connect is provided in the following link (*password is available to interested parties, public end-users, and stakeholders only after registration via the TIMMOD website's Database*):

http://timmod.org/index.php/en/ict-tools/timmod-data-bas)

Web access is offered conditionally after filling a relevant registration form.

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Coming next.

TIMMOD project is coming to its end in May 2022. For the final stage of the project implementation we have planned several very important activities and events:

5 National Workshops will be organized in each project partner countries devoted to the national validation of the Innovation Strategy. Active discussions and validation with key monitoring-performers, decision makers, local and national authorities and relevant stakeholders will follow in the end of February.

Second phase of the Demo tests in Black Sea in Batumi, Georgia are planned for the early spring of 2022. It will provide important additional results of observation of water quality and fish abundance, providing a typical seasonal profile of measurement data, having the 1st phase conducted in autumn 2021 and 2nd phase in spring 2022, which is quite essential in fish research.

Final TIMMOD Events in Romania- the project closure will be marked with final series of meetings and digital campaigns including: TV promotional campaign in Romanian, dissemination event, digital promotional campaign. Final regional validation workshop will be organized as well in order to have final feedback and input to the Innovation strategy. The events will be hosted by the Romanian project partner Danube Delta National Institute – DDNI http://ddni.ro

TIMMOD Innovation Strategy is expected to be delivered and disseminated in May 2022.

TIMMOD data-sharing processes between members of TIMMOD project and relevant stakeholders will be promoted. Access to the created FTP repository is open with the use of a FileZilla FTP Client software. Georeferenced files and information for any kind of environmental datasets in the BSB may be downloaded/uploaded by stakeholders and end-users. Access for interested parties, public end-users, and stakeholders is available only after registration via the TIMMOD website:

http://timmod.org/index.php/en/ict-tools/timmod-data-bas

Interactive Glossary of terms will be launched on the project web page in May 2022, including more than 500 terms and definitions from the fisheries sector with translations in all partners' languages (Bulgarian, Romanian, Georgian, and Greek).

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Joint Operational Programme Black Sea Basin 2014-2020

TIMMOD project consortium

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