PN23300301 – Innovative system for managing the dynamics of the Romanian Black Sea coastline by integrating direct measurements, numerical modelling, and remote sensing to create the "Digital Twin" of the Romanian Coastal Zone

**Phase 1 Evaluation of the existing data for the analysis of the recent dynamics of the Romanian Black Sea coast. First field measurements conducted after the high energy season. Analysis of the most popular open-source data portals used for storing scientific data and selection of the most suitable platform for developing a system to store and share the data collected during the project.**

Objectives: (I) Evaluate existing data to analyze the recent dynamics of the Romanian Black Sea coast and conduct the first field measurements after the high energy season.; (II) Analyze the most popular open-source data portals for storing scientific data and select the most suitable platform to support the development of a system for storing and sharing data collected during the project

To achieve these objectives, a field campaign was conducted in March 2023. During this campaign, measurements were taken at the following locations: Edighiol Nord, Edighiol Sud, Chituc, Midia, Mamaia, Tomis, Eforie Nord, Eforie Sud (cordon litoral Tekirghiol), Costinesti, Neptun-Jupiter, and Venus-Saturn.

This stage also involved analyzing the characteristics of the two main data portals commonly used by the scientific community for data storage and management. Both portals were installed and reviewed. Based on the observations made during the testing phase with sample datasets, a scoring table was developed. This table was later used to select the platform that will be adopted for data management in the project.

**Phase 2: Field measurements to assess the dynamics of the beach sectors (in front of the Danube Delta and the southern sector). Sediment sampling.**

Objectives: (I) Conduct field measurements to assess the dynamics of the beach sectors in front of the Danube Delta and in the southern sector; (II) Sediment sampling

To achieve these objectives, shoreline position measurements, transverse beach profile surveys, field observations, and sediment sampling were carried out. Three field campaigns were organized as following:

* In June 2023, at the start of the low-energy season, observations were made on shoreline position and the morphology of selected beaches for seasonal measurements. These beaches included: Edighiol Nord, Edighiol Sud, Chituc, Midia, Mamaia (north, center, and south), Tomis (north, center, and south), Eforie Nord, Eforie Sud (cordon litoral Tekirghiol), Costinești, Neptun-Jupiter, and Venus-Saturn. Aero-photogrammetric measurements were also conducted at Edighiol during the same field campaign.
* In July 2023, observations were made on shoreline position, beach morphology, and sediment sampling at the Perisor, Periteasca, Portita and Periboina sectors (in front of the Danube Delta - Razelm-Sinoe Lagoon complex).
* Between July and August 2023, observations on shoreline position, beach morphology, and sediment sampling were conducted between Sulina and Sahalin Island (Sulina, Canalul cu Sonda, Câșla Vădanei, Sf. Gheorghe, and Sahalin Island) in front of the Danube Delta. During this field campaign aero-photogrammetric measurements were also performed at Sfântu Gheorghe.
* In September 2023, at the end of the summer, observations on shoreline position and beach morphology was conducted at the following locations: Edighiol Nord, Edighiol Sud, Chituc, Midia, Mamaia (north, center, and south), Tomis (north, center, and south), Eforie Nord, the Tekirghiol coastal barrier (Eforie South), Costinești, Neptun-Jupiter, and Venus-Saturn.

During the field campaign in July and August 2023, shallow sediment samples were collected from 11 profiles, representing the following beach sectors: Sulina, Canalul cu Sonda, Câșla Vădanei, Sfantu Gheorghe, Sahalin Nord, Sahalin Sud, Perisor, Periteasca, Portita Nord, Portita Sud and Periboina.

**Phase 3 Coastal morphology field measurements and laboratory analyses of beach sediments samples. Analysis of bathymetric data and preparation for their integration into the SHYFEM hydrodynamic model grid. Installation and configuration of the data portal**

Objectives: (I) Conduct field measurements and laboratory analyses to assess coastal morphology and beach sediment composition.; (II) Analyze bathymetric data and prepare it for integration into the SHYFEM hydrodynamic model grid; (III) Install and configure the data portal.

To achieve the objectives, shoreline position measurements were performed in November 2023 in Edighiol Nord, Edighiol Sud, Chituc, Midia, Mamaia (north, center and south), Tomis (north, center and south), Eforie Nord, Eforie Sud (cordon litoral Tekirghiol) Costinesti, Neptun-Jupiter and Venus-Saturn. During the same field campaign aero-photogrammetry measurements were performed at Edighiol Nord.

Sediment samples from the beaches in front of the Danube Delta collected during the summer field campaigns were analysed. Bathymetric data was alalysed and prepared for integration into the SHYFEM hydrodynamic model grid.

The requirements for the hydrodynamic model were updated for the summer period of this year. To do this, daily flow data from the Danube, available on the website of the National Institute of Hydrology and Water Management (INHGA) in Bucharest, were extracted. Additionally, data on wind speed and direction, salinity, and seawater temperature from the EUX02 and EUX03 buoys of the EMSO-EUXINUS network operated by INCD GeoEcoMar were also used.

During this stage, installation, testing, and configuration activities were conducted, resulting in the following outcomes:

* The software environment necessary for the operation of the GIS data infrastructure within the project was installed (data portal CKAN + Geoserver + Mapbender).
* The necessary connections between the project’s software platforms were configured (Geoserver and Mapbender).
* Using test data, the core functionality of the GIS data infrastructure was verified, including the ability to retrieve, store, edit, query, and represent geospatial data needed for the project (CKAN and Geoserver).
* The software configuration (CKAN + Geoserver) of the GIS data infrastructure was tested.

**In 2023, a TRIMBLE R12I GNSS SYSTEM with TRIMBLE TDC600 control unit and accessories was purchased within the project.**