

Core Program (Climate change- Monitoring of Sturgeons- Environmental issues) RESCMANS PN 19 43

In conjunction with the objectives set out in the Institute`s own Development Strategy and the “National Strategy for Research, Development and Innovation 2014 – 2020” (SNCDI), the aim of the Core Program “Climate Change – Monitoring of Sturgeons – Environmental Issues” (RESCMANS) is to carry out multidisciplinary and interdisciplinary research-development-innovation activities, at a high standard of excellence, that concern environmental protection and its related fields. This will be achieved by addressing issues of particular importance for Romania such as: climate change, conservation of endangered species from the lower course of the Danube River , hydrodynamic and hydromorphological monitoring, numerical modeling, the synthesis of eco-friendly materials, the removal of emerging pollutants from water, the presence of micro / nanostructured pollutants in aquatic ecosystems, waste management, CO₂ recovery technologies, air pollution in large urban agglomerations, renewable energy, etc., or identifying possible cross-border impact risks that could negatively impact Romania, such as the Bystroye Canal, etc. Thus, the Core Program promotes applied and assumed solutions in the field of environmental protection.



INCDPM



- **Partners**

Beneficiary: Ministry of Research and Innovation

- **Project coordinators**

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- **Period**

2019 – 2022 (Ongoing)

- **Financed via**

Bugetul de Stat – Ministerul Cercetării și Inovării

Objectives

Objective 1 – Climate change

Research for this objective will focus on the following:

- identifying climate change adaptation/ mitigation measures with the aim of implementing the appropriate measures so that the national GHG reduction targets are met;
- assessing the impact of climate change adaptation/ mitigation measures on ecosystems and the ecosystem services they provide.

Objective 2 – Sturgeons

Research for this objective will focus on the following:

- identifying a minimally invasive method for determining the age of sturgeon individuals;
- inventory of ichthyofauna from the lower course of the Danube River by conducting scientific fishing;
- intensive monitoring of the areas that are affected by hydrotechnical works and determining the swimming speed of sturgeon species (a novel approach concerning the monitoring of sturgeon behavior);
- setting up pilot sites in locations that may represent possible breeding habitats suitable for sturgeon species;
- carrying out scientific fishing in order to capture juvenile sturgeon resulting from the natural reproduction of wild species and, if applicable, their ultrasonic tagging in order to follow the routes taken towards the Black Sea's habitats that are suitable for their development;
- monitoring the behavior of sturgeon species during the 4 years research cycle with the aim of tagging with ultrasonic transmitters a minimum of 100 individuals from the 4 sturgeon species;
- performing individual monitoring of ultrasonically tagged sturgeons in order to identify their behavior.
- a Romanian- American exchange of experience, with support of the Ministry of Research and Innovation, in the form of a visit by the INCDPM Bucharest's researchers (involved in the sturgeon monitoring activity) to the United States, in collaboration with Dewayne Allen Fox PhD, in order to enrich the horizons of Romanian research regarding the monitoring of sturgeon species.

Objective 3 – Hydromorphological monitoring and numerical and physical models

The project proposals under this objective will focus on the following topics:

- the creation of a database from the available satellite images of the Danube Delta and its permanent updating as the new data emerges; using the database to locate, identify and map out the modified areas in order to assess their spatial and temporal dynamics;
- development, calibration and validation of a hydrodynamic and morphohydrodynamic numerical model of the Chilia – Bystroye – Old Stambul area based on *in situ* measurements;
- making short term and medium term scenario-based projections on the trend of morphodynamic changes of Chilia – Bystroye – Old Stambul area (worst case scenario, best case scenario);
- analysis of the spatio-temporal dynamics of the morphohydrodynamic changes in the Chilia – Bystroye – Old Stambul area, in the form of a comparative matrix, based on *in situ* measurements, on the results obtained from the numerical simulations and the satellite data;
- carrying out the environmental impact assessment of the morphohydrodynamic changes on the migration pathways and the habitats of the sturgeon species from the Chilia – Bystroye – Old Stambul area;
- cartographic materials – graphical representations and databases regarding the natural reference state of the sector between Izvoarele and Vadu Oii;
- GIS maps and satellite imagery for the monitoring of hydrodynamic and hydromorphological conditions of the study area;
- realization of a physical model for the study of the general conditions, respectively of a calibrated and validated numerical model for the study of the particular detail requirements, taking into account the complementarity of these simulations;
- identification of navigation risk areas and the realization of hydromorphological “footprints” in relation to river discharge and correlated with climate change scenarios (drought-flood conditions);
- making projections concerning the long-term impact of the current hydrotechnical works in order to eliminate the risk of interrupting the sturgeon migration routes;
- realizing projections on the long-term impact of the future implementation of hydrotechnical solutions to solve the discharge redistribution issue on the Bala and Old Danube Branches, taking into account the **sine-qua-non** condition of keeping the sturgeon migration routes open (for the study area);
- realization of hydromorphological “footprints” for the study area as well as the projection of their evolution in order to eliminate the risk of blocking off the navigation routes and implicitly the migration of the sturgeons;
- elaboration of measures to ensure suitable navigation conditions for the study area, taking into account the long-term impact of the DKLB – C solution, corroborated with the existence of hydromorphologically “footprinted” risk areas;
- dissemination by participation to national / international conferences and / or publications in journals indexed in international databases (ISI or BDI);
- development of patents for the technical solutions assumed.

Objective 4 Water quality and sediment quality

The project proposals under this objective will focus on the following topics:

- assessing the levels of emerging pollutants (pharmaceutical compounds) present in aquatic ecosystems using complex analytical methods;
- the development of complex analytical methods for the quantification of novel pharmaceutical micropollutants from different environmental matrices using high performance techniques;
- development of purification techniques, at the laboratory scale, for the removal of pharmaceutical micropollutants from wastewater;
- ecotoxicological assessment of emerging pollutants;
- plotting risk maps concerning contamination with emerging micropollutants (pharmaceutical compounds);
- testing and optimization of qualitative analytical methods of micro / nanostructured and elemental pollutants from water, sediment, soil and the biota;
- principles for the removal of micro / nanostructured pollutants from water;
- investigation of areas identified as having critical status and the distribution of micro / nanostructured and elemental pollutants in aquatic ecosystems compartments (water, sediment, biota);
- designing, building at a laboratory scale and testing an experimental module for removing micro / nanostructured pollutants from water.

Objective 5 Nanomaterials

Research for this objective will focus on the following:

- synthesizing innovative environmental-friendly nanomaterials by harnessing secondary materials;
- improving the properties of innovative environmental-friendly nanomaterials in order to increase the retention capacity of pollutants using different processes.
- synthesizing of innovative hybrid environmental-friendly nano-hybrid materials, based on inorganic binders and nanopowders, with high performance properties, by using secondary materials containing silica and alumina;
- determining the durability of the developed environmental-friendly nano-hybrid materials by exposure to various aggressive environments, under controlled aging conditions (chemical and physical treatments).

Objective 6 Renewable energy

Research for this objective will focus on the following:

- updating the information on the distribution of Romania's energy potential (graphical representations on the solar, wind and hydropower potential at the national level);

- establishing the efficiency of complex electricity generating systems using multiple energy sources (a comparative matrix based on the data obtained from laboratory and field tests);
- determining the connection between raw materials used in renewable energy technologies and waste from which secondary raw materials can be obtained by recycling (an analysis matrix);
- the development of technologies that underlie the implementation of renewable energy systems from recycled materials (two technologies);
- increasing the efficiency of photovoltaic cells made from secondary raw materials (two new types of photovoltaic cells);
- at the experimental level, the execution of a model representing a low consumption conventional energy house;
- increasing the efficiency of a wind turbine by adapting it and placing it in a decommissioned tower building;
- optimization of a turbine by using components made of composite materials obtained from recycling of waste

Objective 7 Air quality

Research for this objective will focus on the following:

- identifying and mapping the critical points in the city of Bucharest;
- measurements of air quality parameters at fixed points, time intervals (day / night) and in different seasons;
- modeling the dispersion of atmospheric pollutants in the urban environment;
- developing the most appropriate pollution reduction measures, based on the results of the air quality monitoring study.

Objective 8 Management and recovery of waste

The project proposals under this objective will focus on the following topics:

- the implementation of a methodology that utilizes CO₂ for the neutralization of hazardous industrial waste (resulting from the processing and treatment of metallic surfaces);
- creating innovative cellular concrete construction materials by incorporating CO₂ in their composition, using blast furnace slag and testing cements that have the property of incorporating CO₂ from the atmosphere by implementing them;
- obtaining neutralizing agents using CO₂ and applying them for acid wastewaters originating from mining or similar industries;
- analyzing at international level the methods for the decomposition of waste from technological processes, such as waste emulsion or other similar waste, in order to select electrolytic and chemical methods applicable at the national level;
- experimental laboratory research on the application of electrolytic processes for the decomposition of waste from technological processes, such as waste emulsions or other similar waste, identifying the recoverable components and the methods for treating / capitalizing of these components;

- experimental laboratory research on the application of chemical processes for the decomposition of waste from technological processes, such as used emulsions or other similar wastes, identifying the recoverable components and methods of treating / capitalizing of these components;
- the development of a comparative analysis of electrolytic and chemical processes of the decomposition of waste from technological processes, such as waste emulsions or other similar waste, in order to determine their efficiency;
- elaboration of a manual that presents methods for the treatment and recovery of waste from technological processes, such as used waste emulsions or o similar waste, applicable at the national level;
- dissemination of project results at national and international level.

Expected results

- Research studies.
- Databases resulting from research studies.
- Physical models.
- Numerical models.
- Hydromorphodynamic models
- Comparative matrices.
- Guides to good practice.
- Informational handbooks.
- Manuals with methodologies.
- Experimental models.
- Monitoring systems.
- Development of hydrotechnical solutions.
- Drawing up maps according to the objectives of the Core Program projects for the period 2019-2022
- Creating graphic representations.
- Making scenarios and projections.
- Developing advanced analytical methods.
- Development of methods for the quantification of micro / nanostructural pollutants.
- Development of new techniques and purification solutions.
- Development of new technologies and experimental facilities.
- Synthesizing nanostructural material based filters.
- Synthesizing innovative environmental-friendly hybrid materials
- Developing and proposing measures to reduce the pressures that act on the environment and on biodiversity.
- Test reports.
- Patent applications.
- ISI and BDI indexed scientific publications.
- Dissemination of results by participation to scientific communications and events.

