Goals, Strategies, Progresses

Earth Sciences for Sustainable Development (2023-2027)

MUR Excellence Project





Earth Sciences for Sustainable Development(2023-2027)

MUR EXCELLENCE PROJECT

The Excellence Projects of the Italian Ministry of University and Research (MUR)

The main objective of the MUR Excellence Projects is to promote high-quality research, foster collaboration among academic institutions, and stimulate the growth of the Italian research system through investment in human resources, infrastructure, and scientific knowledge.

The MUR Excellence Projects are selected about every six years through competitive procedures, which are accessible only to highly-qualified Italian departments.

In the 2022 call, <u>the Geoscience Department competed and succeeded with a</u> <u>project titled "Earth Sciences for Sustainable Development</u>.

Earth Sciences for Sustainable Development (2023-2027): Project overview

Over the past two centuries, rapid population growth, extensive land use, and the consumption of finite natural resources have thrust humanity into global-scale unprecedented challenges.

The Department of Geosciences centers its future around addressing these 21stcentury global challenges, with a strong emphasis on sustainable development.

This project aims to understand the impact of human activities on the planet, propose risk mitigation strategies, and promote sustainability.





The department focuses on three research areas:

- climate change and risk mitigation
- georesources for energy transition
- water resource and soil protection and management

The proposed scientific approach integrates numerous earth science disciplines through the innovative use of big data analysis.

The project's goals include elevating the department's national ranking, enhancing its international reputation, advancing research with socio-economic implications, and educating a new generation of experts in sustainable development.

Additionally, the project aligns with the United Nations' Agenda 2030 Sustainable Development Goals.

To achieve these objectives, the project involves actions such as hiring new faculty and a technician, acquiring field infrastructure, big data analysis capabilities.





The enhancement of highly qualified education will be achieved by establishing dedicated doctoral scholarships and introducing innovative teaching methods within their master's degree programs.

Research



Goals

The project aims at consolidating its research activities in the field of Applied Geosciences, with particular emphasis on research areas connected with the Sustainable Development Goals (SDGs) outlined in the United Nations' Agenda 2030.

In this frame, the project aims to achieve four major scientific objectives (SO): - Protection and management of water and soil resources (SDG 6, SDG 11, SDG 13, SDG 15)

- Georesources for energy transition and geomaterials (SDG 7, SDG 9, SDG 11, SDG 12, SDG 13)

- Impact of climate change and risk mitigation (SDG 11, SDG 13, SDG 14, SDG 15)

- Use of Big Data in Geosciences with specific reference to objectives S1, S2, and S3.

Strategies

Personnel recruitment will play a crucial role in the achievement of these scientific objectives.



The recruitment will take place in the fields of Structural Geology (Georesources for energy transition), Applied Geophysics (Protection and management of water and soil resources), Atmospheric Physics (Impact of climate change and risk mitigation) and Hydrology (Impact of climate change and risk mitigation).

Recruitment will also encompass the hiring of a technician for laboratory activities in the frame of studies related to the project. Recruitment activities will be complemented by internal calls for six research projects that align with the overarching theme of "Geosciences for Sustainable Development." These projects will undergo evaluation by external experts and will receive funding of approximately 70.000 euros each, with a duration of 30 months.

Progresses

2023_June. Call for a tenure track position (RTDb, SSD: ICAR02) in the frame of Scientific Objective "Impact of climate change and risk mitigation" 2023_July. Call for 3 research projects (total budget 210.000 euros)

Infrastructures



Goals

A significant effort will be made to integrate Data Science techniques into the study of the project's subject matter, aiming to establish the DG Department as a centre of excellence in conducting cutting-edge research.

Additionally, the Department is pursuing the acquisition of new equipment within the field of environmental geochemistry and the investigation of the Earth's Critical Zone.



The project aims to achieve three major infrastructural objectives:

- Establishment of a high-performance computing and artificial intelligence infrastructure for vertical analysis of big data and 2D/3D modeling in Geosciences.

- Development of a geochemistry laboratory for environmental studies.

- Development of field infrastructure focused on studying and monitoring the Earth's Critical Zone

Strategies

The main investment of the project is represented by the establishment of a supercomputing and big data analytics infrastructure with AI. This infrastructure is considered essential to cope with the exponential increase in the availability of digital data related to the geosphere, which is also functional to other scientific objectives of the project. A significant advancement in the development of a new geochemistry laboratory will be realized through the acquisition of an ICP-MS spectrometer and..XX. Acquisition of a field equipment system for monitoring and investigating the Critical Zone (CZ) will include XXX.

Progresses

2023_MESE.

Highly Qualified Education



Goals



One of the project's key priorities is to train students thoroughly in the latest research approaches and themes in geosciences. This overarching objective will have an impact on both the Doctoral Course in Geosciences and Master's degree programs at the Department.

The project aims to achieve four major objectives for highly qualified education:

- Doctoral Course in Geosciences: Training a new generation of geoscientists and professionals with expertise in environmental issues, including the use of big data.

- Master's degree courses:

A) Expansion of the curriculum and educational activities related to the following themes:

- protection and management of water and soil resources
- georesources for energy transition and geomaterials
- impact of climate change and risk mitigation

B) Integration of innovative teaching elements such as data digitalization and 3D modeling.

C) Strengthening the level of internationalization.

Strategies

The project will fund six Ph.D. scholarships, focused on research topics and methodologies related to the major scientific objectives, and specialized courses on Data Science techniques will be organized for PhD students. The Department will initiate internal calls to organize summer schools in line with the overarching theme of "Geosciences for Sustainable Development," with a budget allocation of 20.000 euros. In the frame of Master's degree courses, significant expansion of the existing virtual classroom is planned, and a dedicated digital microscopy classroom will be established.

Progresses

2023_April. First call for Ph.D. positions

2023_September. First call for summer school organization

2023_October. XX and XX begin their Ph.D. journeys under the guidance of Prof. YY and ZZ, respectively.



Socio-Economic Development



Goals

Consolidation of research activities in the field of Applied Geosciences poses bases for a remarkable socio-economic impact of the project.

Specifically, the project aims at:

- Consolidate existing relationships and develop new collaborations with local authorities and industries in the field of sustainable development.

- Strengthen external communication and increase knowledge and technology transfer.

Strategies

A definite committee (namely "Third Mission Committee"), established at the Department since 2018, will aim to further improve knowledge and technology transfer and promote initiatives to enhance and develop collaborative relationships with local authorities and industry, particularly in light of the research topics promoted within the project.

Progresses

