

Theme 1. Natural and Human Dynamics affecting the Planet

Partner countries – Norway, Denmark, Canada, Finland, China, Australia, the United States, Belgium, Spain, Italy, Germany, France, the United Kingdom, Sweden, South Africa, Argentina.

Graduation Courses - Anthropology, Biological Sciences (Molecular Biology), Sustainable Development, Law, Ecology, Economics, Informatics, Geology, Geography, Geotechnics, Mathematics, Chemistry.

The Earth could be seen as a living body that pulsates, has moving inner parts, releases heat, and is in constant evolution; its transformations can take place on the scale of just a few seconds or extend across millions of years. If we are to understand the planet, we must understand its processes, which include the evolution of life, mapping out mineral, petroleum, and water resources, oceanic and atmospheric circulation, the topography and paleogeography of the continents, the distribution of earthquakes, and the formation of soils. Fossils from some 3.8 billion years ago preserve information on much of the history of life on Earth and allow us to reconstruct past environments and environmental changes over time, including chemical changes, changes in sea levels, temperatures, and global carbon dioxide and oxygen levels. Important processes for understanding the accumulation of oil, gas, coal, and uranium and the generation of mineral deposits can be evaluated on different scales, yielding information about the planet's internal and external dynamics. Also of interest are the ice ages, important markers of climate change. The most recent one marked the transition from the Pleistocene to the Holocene, around 11,700 years ago. Today, a new division called the Anthropocene is being discussed, which would reflect when humans started interfering significantly in the space in which they live. Risk and environmental impact assessments and studies of the dynamics of water resources under pressure from climate, environmental, and socio-demographic changes could spawn new creative, sustainable solutions. Identifying transformations of the Earth could lead to the development of models and tools for addressing problems like renewable energy generation, energy transmission, large infrastructure projects (e.g., dams and offshore oil rigs), and the creation of new materials. Other subjects worthy of investigation include complex forms of human expression, such as artistic manifestations, including cave art, and language acquisition/learning processes.

Subtheme 1.1. - History of the Dynamics of Life on Earth: paleoenvironment, climate change, and socio-environmental impacts

- *The mapping of past environmental changes and modern analogs;*
- *The study of chemical changes and changes in sea levels, temperatures, and global oxygen and carbon dioxide levels;*
- *The mapping of natural disasters and implications for modern society.*

Subtheme 1.2. - Mineral, Petroleum, and Water Systems: geodynamics, commodities, and socio-economic significance

- *The application of geophysical methods, like reflection seismology and magnetotellurics, to the mapping of transcrustal structures;*
- *The definition of criteria for multi-scale and multi-stage modeling using the features of a mineral system, generating future, economic, and social scenarios;*
- *The study of the pre-salt petroleum system and the economic impacts for Brazil;*
- *The application of high-resolution geophysical methods to the mapping of potential water systems in Brazil;*
- *The classification of exploration blocks based on economic and exploration criteria.*

Subtheme 1.3. - Changes in Land Use and Natural Resource Usage

- *The development of models and technologies for environmental preservation and/or recovery, minimizing the impacts caused by human activity;*
- *Studies designed to significantly improve the socioeconomic and environmental safety of large dams (for hydropower plants and mine tailings) and offshore rigs.*

Subtheme 1.4. - New Materials (Rare metals, sources of raw materials)

- *The development of new materials and technologies capable of improving the efficiency and diversification of the Brazilian energy mix, focusing on increasing the use of renewables, like solar and wind energy, and the intensive and safe use of pre-salt oil reserves;*
- *The search for sources of high-technology metals, which are essential for the development of new materials.*