National Institute for Earth Physics (NIEP)

Mission

Expansion of the boundaries of scientific knowledge, its creativity and efficiency increase through fundamental and applied researches in Earth physics domain, in general, and seismology domain, in particular

Main research directions

- Seismicity, earthquake monitoring and database management
- Seismic source physics
- Structure and dynamics of Earth interior
- Seismic hazard and risk
- Engineering seismology
- Earthquake forecasting

NIEP participates to the National Program of Seismic Risk Management and to the Plan of prevention of the local and central authorities to major earthquake impact with researches on:

(1) Early warning system for industrial installations and other equipment of national interest in case of strong earthquakes;
(2) Seismic hazard mapping of Romania;
(3) Seismic microzonation of dense-populated zones;
(4) Shakemap;
(5) Seismic tomography of dams

Seismic network - Strategic objective of national interest

To monitor seismic activity in Romania and implement earthquake warning and prevention systems, NIEP operates the most homogeneous and dense real-time regional network in the Eastern Europe. The network is connected to European (ORFEUS) and global (IRIS) networks and actively contributes to the international exchange of data.

General strategic objectives

1. Development of infrastructure for research activities and supporting centers, programmes, innovation and forefront projects, with high potential of international recognition and validation
2. Increase of research quality by orienting research activities and evaluation initiatives to products at the level of international standards
3. Capacity development in implementation of disaster management and in seismic risk mitigation assessment

4. Development of applicative research branch based on achievement of products and services
5. Development of systems of information/early warning to earthquakes
6. Better dissemination and use to public of research results

Other specific objectives

Information, education, awareness and training

- Achieving in the institute of a center for information, education and training of population at all levels as concerns seismic risk and earthquake effects mitigation
- Setting partnerships with formal (schools) and informal (museums) education units by creating a framework for running joint programmes (laboratories, expositions, thematic visits) and implementation of an iterative system of communication and transfer of knowledge (e-learning platforms, digital resources, tele-presentations and tele-conferences)
- Periodical organization of meetings, manifestations of training and dissemination designed and tailored for target groups (pupils and students, members of local administration and inspectorate for emergency and of other institutes activating for emergency situations management)

Interdisciplinarity and transversal cooperation

- Increasing the capacity to approach global and critical problems for society
- Supporting inter-disciplinary research teams and multi-disciplinary programs and partnerships between different domains in order to solve global, environmental problems.
- Supporting inter-disciplinary research teams by employing young people specialized in poorly represented domains: geology, geophysics, geography
- Flexible platforms and inter-disciplinary networks: databases, inter-operational processing techniques (e.g., integration of satellite, geophysical, geodesic data, maps, GIS programs and GPS data)

Transfer of knowledge and technology

- Definition and support of areas of priority and national interest
- Attracting local funds
- Prospecting of potential beneficiaries of research results, mainly as regards those applicable to early warning, seismic protection, site classification of strategic objectives, earthquake prognosis etc.
- Setting an optimal ratio between academic research and marked-oriented research, following the society requirements
- of dissemination of scientific results and know-how to decision making factors, government, mass-media
- Dissemination to society and decision making factors of relevant and potentially applicable results
- Optimization of strategy for information and communication of research results

Recent representative projects

At national level

DACEA Project - *Danube Alert System for Earthquakes* (http://www.quakeinfo.eu/en/)
Cross-border project in cooperation with Bulgaria (2010 – 2012)

Objectives

- Prevention of the natural disasters generated by earthquakes in cross-border area Romania-Bulgaria, developing the early warning integrated communication network and capacity building at local level based on results of research in this field
- Assessment of seismic risk and earthquake effects in the Romania – Bulgaria cross-border area
- Development and implementation of an integrated seismic network and tools for processing, archiving and communication to risk assessment
- Increase the capacity of local institutions/emergency intervention units for joint response activities in case of disasters

The project achievements include studies on warning systems applicable to cross-border area, an integrated database related to seismicity, geology, socio-economical particularities of the study area, development of tools to process databases, implementation of the warning system and rapid risk evaluation in case of earthquakes.
As a follow up, an integrated system for rapid earthquake information was installed and is presently operating. NIEP provides to local authorities and civil protection rapid information on earthquake parameters and expected effects in the sites of interest.

RO-SHARE Project- *Harmonization of Seismic Hazard in Europe* (www.share-eu.org)
Project belonging to PN II Program – Capacities (2010 - 2012) in support to SHARE FP7 project. The main objective was the integration and harmonization of databases and methods to assess seismic hazard in following the integration strategies recently promoted in the framework of European Community programs.

Objectives

- Development of models for seismic hazard computation at multi-national scale
- Framework for inter-disciplinary integration by involving competence and expertise in all the related domains, from earthquake engineering to geology and for trans-national integration
- Analysis of compatibility with existing standards (mainly Eurocode 8)

Significant project achievements are: catalog reevaluation, parametrization of seismic sources and active faults capable to generate earthquakes of 5.5 magnitude threshold in the main tectonic active areas of Europe, development of a unitary model for assessing and predict ground motion at European scale (special emphasis on regional effects for atypical seismic zones, like Vrancea).

BIGSEES Project – *Bringing the Gap between Seismology and Earthquake Engineering: from the Seismicity of Romania towards a Refined Implementation of Seismic Action EN in Earthquake Resistant Design of Buildings* (http://infp.infp.ro/bigsees/default.htm)

Project belonging to PN II Program (2012 – 2015) aimed at developing of adequate standards and designing correspondingly the buildings. The scope of the project is to improve the efficiency of earthquake risk mitigation methods and their capability of protecting structures, infrastructures and people.

Objectives

- Project aims at assessing the best way to use jointly all the information coming from earthquake forecast, vulnerability decrease in a probabilistic framework fit for decision making.
- Improvement of existing standards (Eurocode 8) for Vrancea earthquakes

Starting from the new database (geology, seismology, waveforms recorded in boreholes and at surface), modeling of local site geology, soil characterization and identification of associated control periods and amplification factors, the project will contribute to improving and adjusting the existing codes to the specificity of the Vrancea zone.

ROEDUSEIS Project – *Educational Seismic Network in Romania* (http://www.roeduseis.ro/)
Project belonging to PN II Program (2012 – 2015) designed to educate population for disaster situations and increase the educational and awareness level of population to seismic risk

Objectives

- Development, implementation and validation of methodologies for training teachers and pupils for practical activities in the field of Earth sciences
- Installation and management of an Educational Seismic Network which will be administered and operated by teachers.
- Data archiving and dissemination through web
- Use in schools of advanced scientific tools that are usually accessible only in research laboratories

An educational seismic network will be installed during the project, a related database will be created in schools that will be further registered in national and international archives, programs for data acquisition, visualization and processing will be implemented. Project will put into practice educational programs, an e-learning platform and multiple dissemination actions to transfer scientific knowledge to amateur scientific communities in cooperation with local authorities and units for emerging situations.

At international level

NERIES Project - ***Network of Research Infrastructure for European Seismology*** (2006 – 2010) **and subsequent NERA Project** - ***Network of European Research Infrastructures for Earthquake Risk Assessment and Mitigation*** (2010 – 2014) (www.neries-eu.org, www.nera-eu.org)

FP6 and FP7 projects that follow the initiative to set an integrated research structure at European level in the field of geosciences. There are key projects for Earth observation and environmental policy-making and disaster preparedness: GMES (Global Monitoring for the Environment and Security) strategy and of the Group on Earth Observations (GEO) 10-year implementation plan. The scope is integration of European seismic networks in a global network, improving access to data, developing the next generation of tools for improved service and data analysis.

Objectives

- Integration of key infrastructures in Europe to earthquake monitoring
- Integration of procedures to use infrastructures, to data access for research, providing services, products of hazard and risk
- Promoting activities in with other related relevant EC initiatives and projects
- Promoting Grants providing access to highly specialised research facilities

Project results include: catalogues, databases, integrated archives, data exchange in real time, networking for educational programs, portal to disseminate integrated data

EPOS Project – *European Plate Observing System* (www.epos-eu.org)

The goal of EPOS follows the strategy of integration of existing research infrastructures, development of data access from different laboratories in the World in the field Earth sciences and promotion of European consortium to this aim. EPOS coordinates and includes products from projects such as NERIES, NERA or SHARE and establishes the legal frame for implementation of government strategy for research infrastructures in Europe.

Objectives

- Integration of national permanent seismic and geodetic monitoring systems at European scale
- Building of observatories for data acquisition (volcanology, geothermal, in-situ boreholes, experiments of fault monitoring, etc.)
- Set of experimental laboratories designed to investigate mineral properties of rocks and to tectonic modeling
- Facilities for storing, process, visualize geophysical, geological and geochemical data
- Facilities for advanced computing to process and model data at large scale and high resolution