



United Nations  
Educational, Scientific and  
Cultural Organization

Natural  
Sciences  
Sector

# UNESCO science

for Sustainable  
Development

## EARTH SCIENCES

*Building capacity in the earth sciences for the sound management of geological resources and geological heritage in the service of society*

INTERNATIONAL COOPERATION FOR RESEARCH, MONITORING, EDUCATION AND CAPACITY BUILDING IN THE ECOLOGICAL SCIENCES TO BUILD A SUSTAINABLE FUTURE

### Background and description

UNESCO is the only UN Organization which deals with interdisciplinary research, training, education, and capacity-building in geology and geophysics through its programmes in the earth sciences. This long-term UNESCO involvement in the solid earth sciences reflects the importance of geological knowledge for economic development, especially for countries in transition and developing countries. Knowledge of the Earth's resources and how to manage them in an environmentally sound way contributes to raising people's living standards. Geology and geological processes determine conditions for biodiversity including both wild and domesticated flora and fauna, the basis for human well-being.

Geological knowledge allows us to identify mineral resources, and understand geological processes. Changes in the Earth's climate, and life on Earth, are preserved in the rock record. These past environmental lessons shed light on present and future environmental challenges. The Earth's surface, including our habitable environment, is a product of, and is controlled by, deep Earth processes. Throughout history, the development of our society has been intimately linked to the natural history and the resources of our planet. Stone, bronze, iron, gold, coal and oil are but a few of a long list of geological resources that have helped shape our society, leading to the industrial revolution. The new 'silicon age' would not have been possible without geological research and its multiple applications.

The earth sciences not only contribute to overcoming major challenges posed by the geological surface and sub-surface conditions with respect to human development projects such as construction, road-building, tunnels, management of water and energy supplies, waste disposal, but also inform on major threats such as geohazards and climate change. This leads to improved cost effectiveness, and helps mitigate the effects of natural geological hazards, thus saving lives. A global knowledge of the earth sciences is increasingly needed, and UNESCO plays an increasingly important role in this process notably in connecting a variety of partners in the earth sciences with decision-making communities to plan for sustainable development of the Earth and its resources.



### MAIN PROGRAMMES AND ACTIVITIES

#### 1. International Geoscience Programme (IGCP)

With around 40 sponsored research and capacity-building cooperation projects, IGCP improves the interaction and networking between geoscientists and environmental and social scientists in solving fundamental geoscientific problems relevant to sustainable development. The IGCP focuses on the study of sustainable use of mineral and hydrocarbon resources, global change and the evolution of life, the mitigation of hazards of geological origin, the water cycle and the Earth's interior.

#### 2. Global Network of National Geoparks

Through the Global Network of National Geoparks under the umbrella of UNESCO, important national geological sites (64 in 19 countries – 2010) gain worldwide recognition and profit through the exchange of knowledge for the protection and promotion of geological heritage. A Geopark creates employment opportunities bringing economic benefit for the people who live there, including through sustainable tourism.

#### 3. World, regional and continental geological maps

With the Commission of the Geological Map of the World (CGMW), UNESCO prepares geological and earth

resources maps of regions and continents to facilitate the planning of sustainable development of our planet's resources and for the development of transport infrastructure and human settlements. UNESCO cooperates with geological surveys worldwide in the "One Geology" project to create the first web-based geological map of the world.  
[www.onegeology.org/](http://www.onegeology.org/)

#### 4. Geological Applications of Remote Sensing (GARS)

UNESCO in cooperation with the Global Earth Observation System of Systems (GEOSS) stimulates research and capacity-building worldwide in integrating advanced remote sensing and in-situ observation technologies for improved observation of the global changes on the Earth and for the mitigation of the negative impact of hazards of geological origin such as landslides, earthquakes and volcanoes.

#### 5. Study of the Deep Earth

UNESCO works closely with the International Lithosphere Program and the International Continental Deep Drilling Program in the study of the ways the Earth's surface including our habitable environment is responding to processes deep within the Earth. Geophysical and geodynamical tectonics are used to enable a better understanding of the functioning of the Earth as a planet.

#### EXAMPLES

##### Centre on Karst, China

The establishment of the International Centre on Karst Research, in Guilin, People's Republic of China at the Institute of Karst Geology, in December 2008, constitutes the only international centre on interdisciplinary research on karst in the UN system. It is a direct follow-up to the success of more than 15 years of cooperation of three IGCP projects. This first Category II Centre in the earth sciences in UNESCO in the spirit of the

IGCP, cooperates with other international institutions thus contributing to karst-related studies worldwide. Karst areas are very fragile landscapes underlain by limestone eroded by dissolution, producing ridges, towers, fissures, sinkholes, and other characteristic landforms that need careful management to sustain local economies. Karst is found over vast areas of the world; forty countries and one billion people are affected by karst formation.  
[www.irck.edu.cn](http://www.irck.edu.cn)

##### Rock Detectives at North Pennines Geopark (UK)

Young geologists in the North Pennines Area of Outstanding Natural Beauty (AONB) enjoy exploring the area's superb rocks, minerals, fossils and landscapes by joining children's geology clubs and becoming Rock Detectives! The North Pennines Geopark stretches across large parts of the counties of Durham, Northumberland and Cumbria and is one of England's most wild and unspoilt places. A unique geology underpins stunning upland landscapes, important wildlife habitats and a rich historical and industrial heritage. At the three Rock Detectives Clubs dotted around the Geopark the emphasis is on adventure, fun and discovery! Children aged 6 to 12 can get involved in activities from fossil hunts, games and crafts, to video animation and visits to 'hands-on' attractions – all with a geological theme! Rock Detectives is part of the AONB Partnership's Rockworks project, part of a transnational project with nine partner European Geoparks.  
[www.northpennines.org.uk](http://www.northpennines.org.uk)

##### International Year of Planet Earth (IYPE)

The UN-declared IYPE spread over a period of three years (2007-2009) was co-founded by the International Union of Geological Sciences (IUGS) and UNESCO. The 'Year' aimed at ensuring greater and more effective use by society, of the knowledge accumulated by the world's 400,000 earth scientists. Within the IYPE framework, IGCP, Geoparks and One Geology were major outreach endeavors of the earth science community to policy-makers, politicians and the general public to increase awareness of the importance of the earth sciences, fostering sustainable development and promoting local, national, regional and international action.  
[www.yearofplanetearth.org](http://www.yearofplanetearth.org)

##### UNESCO's New Earth Science Education Initiative for Africa

UNESCO has recently launched a new Earth Science Education Initiative in Africa. The aim is to support the development of the next generation of earth scientists in Africa who are equipped with the necessary training, tools, networks and perspectives to apply sound geoscience to facing the challenges of, and benefiting from, the opportunities of sustainable development. Benefits and opportunities include traditional mineral extraction and environmental management such as climate change adaptation, prevention of natural hazards, and ensuring access to quality drinking water.  
[www.earth-science-education-initiative-africa.org/](http://www.earth-science-education-initiative-africa.org/)

##### IGCP Project 493

Some 600 million years ago, one of the most significant events in the Earth's history occurred – a sudden increase in biodiversity, resulting in a variety of hard skeletons in the geological record. The Rise and Fall of the Vendian Biota, IGCP Project 493 is particularly interested in the precise timing of these events, and the effects that changing environments, climates, chemistry and palaeogeography had on the development and diversification of animals, culminating in the spectacular Ediacaran/Vendian faunas. Researchers from many disciplines investigate sections along the coasts of the White Sea in Russia, the Flinders Range of South Australia, the deserts of southern Namibia and the coastal outcrops of Newfoundland. This IGCP project is particularly active in public outreach including students and non-scientists as well as artists. Initiatives include a postage stamp and accompanying teachers' kit, a joint children's publication with Australia Post, symposia, classroom lessons for the general public, jewelry depicting Ediacarans and a CD of music in memory of Ediacarans.  
[www.geosci.monash.edu.au/precseite/](http://www.geosci.monash.edu.au/precseite/)

#### FOR FURTHER INFORMATION CONTACT:

Global Earth Observation Section  
Division of Ecological and Earth Sciences  
UNESCO - 1, rue Miollis  
75732 Paris cedex 15 - France  
[earth@unesco.org](mailto:earth@unesco.org)  
[www.unesco.org/science/earth](http://www.unesco.org/science/earth)