European Commission

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Natural Hazards and Disasters

Research and Innovation

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Natural hazards and how we face them

There has never been a time when natural hazards did not regularly and profoundly affect life on earth. Tales of torrents, floods and earthly upheaval appear in our most ancient myths, and such events have played and continue to play, now more than ever, an integral part in the natural history of our planet.

Today, demographic pressures, unsustainable land use, environmental mismanagement and, potentially, climate change all combine to increase the risk of disasters caused by extreme natural events. These events damage property, infrastructure and economies and cause inexpressible human suffering. In 2010, a total of 385 natural disasters killed more than 297 000 people worldwide, affecting over 217 million others and causing nearly EUR 100 billion in damages[1].

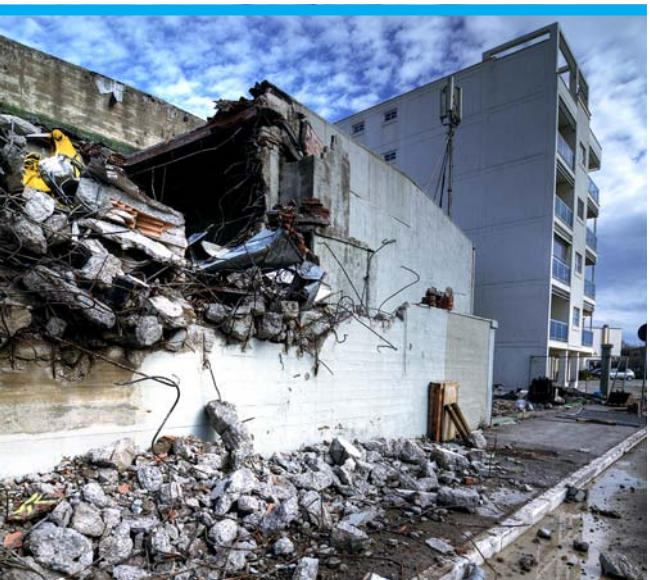
As the world continues to be confronted by natural hazards, single states will always struggle to provide an adequate response when working in isolation. Therefore, it makes more sense to address such hazards from a European and global perspective.

Research priorities

Research into natural hazards also needs to be conducted on transnational and international levels. This is the goal of the EU Seventh Research Framework Programme (FP7), through which the European Commission supports research into the entire 'hazard-vulnerability-risk' chain. Main priorities include: hazard assessment, triggering factors and forecasting; vulnerability assessment and so cietal impacts; risk assessment and management; and multi-risk evaluation and mitigation.

FP7-funded research delivers critical support for key Union policy initiatives, including the Water Framework Directive, the Flood Directive and the Communication on Water Scarcity and Drought. Furthermore, it supports a community approach to the prevention of natural and man-made disasters. It is through the implementation of these and other policies that the EU mobilises its brightest minds and puts into practice its best ideas.

EU policy embraces a strong international orientation, intended to foster more cross-border cooperation and solidarity, while promoting new public-private relationships. The Commission also supports efforts to improve the dissemination of research results. By working to promote communication and dialogue between key stakeholders, scientists, policy-makers and the general public, the European Commission hopes to ensure that all citizens are better aware of the hazards and risks and what can be done about them.



1. Data from CRED http://www.cred.be

Forecasting and early warning

Volcanic eruptions and earthquakes represent a serious threat to lives and livelihoods in several European countries, particularly those bordering on the Mediterranean Sea, where they affect centres of great historical, cultural and socio-economic significance.

Volcanic and seismic events are among the most dramatic agents of change on earth. Volcanic emissions, including gas and ash, can affect human health and life, as well as air traffic and other transport systems. Meanwhile, many people in high-earthquake-risk areas still live in buildings that do not meet modern earthquake-resistance standards and that cannot be brought up to standard in an economically viable way. It is therefore vital to be able to predict and prepare people for these events.

Forecasting and real-time warnings enable quicker and more efficient disaster response, ultimately saving both lives and property. Accuracy and reliability are crucial – the consequences of too many false alarms can be grave in terms of public trust. The challenge, now being addressed by EU-funded projects such as **VUELCO**, is to enhance our knowledge of the causative links between volcanic subsurface processes, precursors, unrest indicators and imminent eruption.

Forward planning

The European Commission believes good science and good international collaboration, like that demonstrated by **VUELCO** and other projects – **MIAVITA**, for example, which is working to mitigate risks near active volcanoes – must underpin the development of credible forecasting and early-warning systems.

Depending on the type of natural hazard, lead times to consider for such systems range from a few seconds or minutes in the case of an earthquake, to minutes or hours for a tsunami, and hours or days for a flood or volcanic eruption. But once you have sound forecasting and early warning, what do you do with it? In a project on earthquakes, called **SAFER**, one goal was to enable the automatic shutting down of critical lines, infrastructures, or transport systems, and to supply near-real-time information in support of decision-making.

Seeing the whole picture: REAKT

Researchers in the REAKT project are, for the first time, addressing all the necessary components of a real-time earthquake risk-reduction system, hoping to gain a better understanding of physical processes underlying seismicity changes.

The project will develop new models for earthquake forecasting and provide analytical tools to assess the fragility of buildings, selected infrastructure and utility systems.

A key outcome will be a detailed methodology for optimal decision-making, associated with an earthquake early-warning system, encompassing operational earthquake forecasting and real-time vulnerability and loss assessment.

Living with risk

One thing is clear: there is no safe place on earth when it comes to natural hazards. The risk is there and it is real, but properly assessing risk is a complex problem.

The term risk refers to the probability of a hazardous event occurring and its negative consequences. However, while hazards themselves have been studied in detail, much less is known about their impacts on people or assets (exposure and human, cultural, institutional and socio-economic vulnerabilities). This side of the equation is greatly affected by risk perception – how do people, communities, cities and regions perceive their situations? These are important factors to consider when assessing the potential negative consequences of a disaster.

Assessing vulnerability

The EU-funded **MOVE** and **ENSURE** projects are helping to improve our understanding of the concept of vulnerability – physical, social, economic and cultural – proposing new and better models that can be integrated into any risk analysis.

Within these projects, awareness-building activities include the elaboration of representative case studies, guidelines, and the creation of an online course in vulnerability assessment for students, young researchers and public administrators. All of this is expected to lead to new and better approaches to risk management.

It is important that people are aware of the levels of risk in particular locations. Populations living in more sensitive zones, for example, must be kept well informed. Only then can they make the relevant choices they need to make about living with risk.

Spotlight on resilience: Embrace

Disaster impact varies greatly in relation to people's exposure and vulnerability, i.e. their susceptibility to the damaging effects of natural hazards. Of more recent interest is the concept of resilience, which is the ability to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner.

The Embrace project is taking an interdisciplinary, socially inclusive and collaborative approach to developing a wider pan-European understanding of what is meant by resilience.

The project will describe a conceptual and methodological approach to characterising, defining and measuring the resilience of a society confronted with natural hazards and disasters.

Effective support for policy

Making good policy aimed at reducing vulnerability and better managing the risk of natural hazards means, first of all, knowing the facts. Policy-makers need access to science and scientists, to develop the best possible plans.

Researchers and policy-makers work in different worlds, with different priorities and according to different agendas. They have different objectives and use different jargon, all of which can make dialogue difficult, to say the least. Interaction between the research and policy-making communities is not yet sufficiently structured to enable the optimal transfer of knowledge and scientific findings – for example, from EU-funded research down to EU, national and regional policy implementation.

The European Commission is aware of this issue and wants to improve the dissemination of information generated by research projects. In this context, improving dialogue channels between key stakeholders and authorities at relevant levels is crucial to the development of a real and long-term risk-reduction perspective.

The Commission interacts regularly with UN-ISDR and contacts are undertaken between the Commission's own departments for Humanitarian Aid and Civil Protection, the Environment, Climate Action, Research and Innovation and the European Environment Agency regarding its disaster-related projects.

To highlight just one example, the EU-funded **Drought-R&SPI** project is working in support of the EU Water Framework Directive and the Water Scarcity and Drought Strategy, to improve our understanding of drought and how to prepare for it. This project, along with numerous others, provides important data and information that can then be passed on to policy-makers and stakeholders in the Member States through the working groups on the Water Framework Directive's Common Implementation Strategy.

Helping the policy-makers: IMPRINTS

Working to increase preparedness for and operational risk management of flash flooding and debris flow, the EU-funded Imprints project responds directly to the European Parliament's 2007 Directive on the assessment and management of flood risks.

That Directive requires Member States to draw up maps identifying all areas exposed to flood risk and to indicate the probability and potential damage for local populations, property and the environment.

The results of this important work in support of the Flood Directive then feed back to policy-makers, thanks to the project's links with UN-ISDR and Commission departments for Humanitarian Aid and Civil Protection, and the Environment.

Project List

CapHaz-Net – Social Capacity Building for Natural Hazards: Toward More Resilient Societies
www.caphaz-net.org/

CATALYST – CApaciTy deveLopment for hazard riSk reduction & adaptation
www.catalyst-project.eu

CLUVA – Climate change and Urban vulnerability in Africa
www.cluva.eu

ConHaz – Costs of Natural Hazards
www.conhaz.org

CORFU – Collaborative research on flood resilience in urban areas
www.corfu-fp7.eu/

DEWFORA – Improved Drought Early Warning and Forecasting to strengthen preparedness and adaptation to droughts in Africa
www.dewfora.net

DROUGHT-R&SPI – Fostering European Drought Research and Science-Policy Interfacing
www.eu-drought.org

EMBRACE – Building Resilience Amongst Communities in Europe
www.embrace-eu.org

ENHANCE - Enhancing Risk Management Partnerships for Catastrophic Natural Disasters in Europe

ENSURE – Enhancing resilience of communities and territories facing natural and na-tech hazards
www.ensureproject.eu

FIRESENSE – Fire detection and management through a Multi-Sensor network for the protection of cultural heritage areas from the risk of fire and extreme weather conditions
www.firesense.eu/

FIRESMART– forest and land Management Options to prevent Unwanted Forest Fires
www.firesmart-project.eu

FLOODPROBE –Technologies for the cost effective Flood Protection of the Built Environment
www.floodprobe.eu

FUME – Forest fires under climate, social and economic changes in Europe, the Mediterranean and other fire-affected areas of the world
www.fumeproject.eu

IMPRINTS – Improving Preparedness and Risk Management for flash floods and debris flow events
www.imprints-fp7.eu

KULTURisk – Knowledge-based approach to develop a culture of risk prevention
www.kulturisk.eu

MATRIX – New Multi-Hazard and Multi-Risk Assessment Methods for Europe
http://matrix.gpi.kit.edu/

MEDIATION – Methodology for Effective Decision-making on Impacts and AdaptaTION
www.mediation-project.eu/

MIAVITA – Mitigate and assess risk from volcanic impact on terrain and human activities
http://miavita.brgm.fr/default.aspx

MICORE – Morphological Impacts and Coastal Risks induced by Extreme storm events
www.micore.eu

MOVE – Methods for the improvement of Vulnerability Assessment in Europe
www.move-fp7.eu

NIKER – New integrated knowledge based approaches to the protection of cultural heritage from earthquake-induced risk
www.niker.eu/

PERPETUATE – Performance-based approach to the earthquake protection of cultural heritage in European and Mediterranean countries
www.perpetuate.eu/

REAKT – Strategies and tools for Real Time Earthquake Risk Reduction
www.reaktproject.eu

RESPONSES – European responses to climate change: deep emissions reductions and mainstreaming of mitigation and adaptation
www.responsesproject.eu

SafeLand – Living with landslide risk in Europe: Assessment, effects of global change, and risk management strategies
www.safeland-fp7.eu/

SHARE – Seismic Hazard Harmonization in Europe
www.share-eu.org/

SMARTEST – Smart resilience technology, systems and tools
www.floodresilience.eu/

STARFLOOD -Strengthening and Redesigning European Flood Risk Practices: Towards Appropriate and Resilient Flood Risk governance arrangements

SYNER-G – Systemic Seismic Vulnerability and Risk Analysis for Buildings, Lifeline Networks and Infrastructures Safety Gain
www.syner-g.eu

VUELCO – Volcanic unrest in Europe and Latin America: Phenomenology, eruption precursors, hazard forecast, and risk mitigation
www.vuelco.net

XEROCHORE – An Exercise to Assess Research Needs and Policy Choices in Areas of Drought
www.feem-project.net/xerochore/index.php

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The EU's Seventh Framework Programme supports research and innovation based solutions at transnational and international level.

Research and Innovation policy

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