

## **Novel Indicators for Identifying Critical Infrastructure at Risk from Natural Hazards**

Eugene OBrien, Director, Roughan & O'Donovan Innovative Solutions, Dublin, Ireland.

Kenneth Gavin, Director, Gavin Doherty Geo Solutions, Dublin, Ireland.

Dina D'Ayala, Reader, University College London, London, UK.

Bryan Adey, Professor, Eidgenössische Technische Hochschule, Zurich, Switzerland.

Tao Cheng, Professor, University College London, London, UK.

Pieter Van Gelder, Director, Probabilistic Solutions Consult and Training, The Hague, Netherlands.

Zoheir Sabeur, Senior Manager, IT Innovation, Southampton, UK.

Alan O'Connor, Director, Roughan & O'Donovan Innovative Solutions, Dublin, Ireland.

María-José Jimenéz, Senior Researcher, Institute of Geosciences (CSIC-UCM), Madrid, Spain.

The achievements of the European Union targets regarding energy and socio-economic sustainability are highly dependent on the way risks and vulnerabilities of European operating infrastructure networks and critical assets are minimised against natural extreme events. The INFRARISK project is developing reliable stress tests for European critical infrastructure using integrated modelling tools for decision-support. As a result it is possible to obtain higher infrastructure networks resilience to rare and low probability extreme events, known as “black swans”. INFRARISK advances decision making approaches and leads to better protection of existing infrastructure whilst achieving more robust strategies for the development of new ones. INFRARISK expands existing stress test procedures and adapts them to critical land-based infrastructure which may be exposed to or threatened by natural hazards. Integrated risk mitigation scenarios and strategies are employed, using local, national and pan-European infrastructure risk analysis methodologies. These take into consideration multiple hazards and risks with cascading impact assessments. The INFRARISK approach robustly models spatio-temporal processes with propagated dynamic uncertainties in multiple risk complexity scenarios of Known Unknowns and Unknown Unknowns. An operational framework with cascading hazards, impacts and dependent geospatial vulnerabilities is developed. This framework is a central driver to practical software tools and guidelines that provide greater support to the next generation of European infrastructure managers to analyse and handle scenarios of extreme events. The minimisation of the impact of such events by the supporting tools establishes optimum mitigation measures and rapid response. INFRASRISK delivers a collaborative integrated platform where risk management professionals access and share data, information and risk scenarios results efficiently and intuitively.