



Disasters and Climate Risks

Disasters and climate risks have a major impact on the economy as well as on the security and well-being of citizens. Most disaster events relate to extreme geological and hydro-meteorological hazards and the impact on Europe has been significant (80,000 deaths and € 95 billion in economic losses over the last decade). Extreme events can cause severe disruption of national and regional economies with potential impacts capable of causing severe loss of function of Critical Infrastructures.

INFRARISK Approach

The improvement of Critical Infrastructure risk assessment methodologies by incorporating resilience analysis with prevention, resistance to disruption, and failure recovery measures has been recognized as a challenging goal for a harmonized framework in Europe in the near future. A central issue for the improvement of prevention and preparedness is the development of stress tests approaches.

The EU-funded INFRARISK project worked on the development of optimal stress testing techniques to contribute to the protection of European Critical Infrastructure. The INFRARISK approach has focused on potential impacts on the European Ten-T Transportation network (road and rail) of natural hazards such as earthquakes, flooding, and landslides.

INFRARISK Results

- Development of a process to ensure that levels of infrastructure related risk due to natural hazards are acceptable. The process includes conducting stress tests.
- Validation through application to cases studies
- INFRARISK Decision Support Tool (IDST)
Ongoing development of integrated workflow processes for defining the risk due to natural hazards, their geospatial coverage and their likely impacts on critical infrastructure.
- GIS knowledge Base (KB)

The Risk Assessment Process

INFRARISK risk process assesses infrastructure related risks due to natural hazards with stress tests. The risk assessment process is applicable independently of the hazard to be considered, the infrastructure objects to be taken into account and the types of consequences to be considered. Additionally, the process can be used to take into consideration simple and complex system representations, i.e. representations that include cascading events, and can be used for all types of stress tests, i.e. the scenarios to be analysed and the criteria to be used to judge if risk levels are acceptable. Particular emphasis has been placed on the incorporation of the spatial and temporal characteristics of natural hazards, infrastructure networks and the related consequences, which can make it useful to use geographic information systems and mapping technology.

The risk assessment process is generic. This is particularly important in the context of climate change and in the context of the ever changing situations in which infrastructure managers find themselves. The use of such a process helps decision makers not only evaluate their risks, but also allows them to decide in reasonable time frames and amounts of effort whether risk levels are acceptable or interventions need to be executed to reduce risk.

The methodology was tested in two case studies In Italy and Croatia. The Italian case focused on the impacts of extreme, low probability seismic hazard scenarios and the landslide cascading hazard effects for a road network located in the province of Bologna in northern Italy. The impacts were determined by comparing simulated post-hazard traffic scenarios to the network operations under 'normal' conditions.

For the Croatian case study, the impacts of extreme, low probability flood hazard scenarios on a national rail network were evaluated. A qualitative risk assessment was initially performed using the Objective Ranking Tool (ORT) method to demonstrate the use of such a methodology to determine the rail sections along the network where the risk is most substantial. The overall consequences were assessed in both in terms of the direct restoration costs and durations for the network along with the potential disruption to freight and passenger rail transport.

INFRARISK Decision Support Tool (IDST)

The INFRARISK Decision Support Tool (IDST) is an advanced information system that enables civil engineers, infrastructure maintenance agencies and crisis managers to assess the potential risks due to natural hazards and their associated cascading effects. The hazards considered include earthquakes and floods, as well as their cascading landslide effects.

The IDST hosts specialised databases with supporting scenario simulations for natural hazards and their likelihood of occurrence in relation to CI. Data analytics modules are also supported, providing geographically-mapped-infrastructure vulnerabilities to natural hazards, in terms of structural damage and functionality loss for CI networks.

The IDST is a web-enabled system portal, which is accessible via a user-friendly web browser under multiple client platforms (laptop, tablet, etc.) and operating systems (Windows, Linux, etc.).

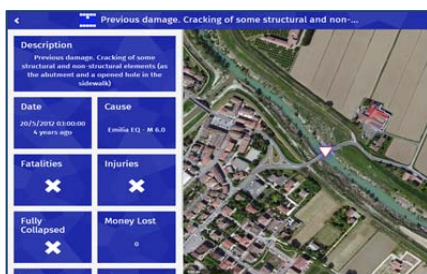


INFRARISK IDST

INFRARISK Knowledge base (KB)

The INFRARISK Knowledge Base allows users to upload, transform and query data relating to infrastructure components and natural disaster events. Infrastructure managers, researchers on risk management, transportation, civil engineering, natural sciences, etc., would benefit significantly from this extensive database.

A Resource Description Framework Schema (RDFS) for infrastructure components and events can be used to formally represent and exchange data between Web applications. The INFRARISK GIS Knowledge Base is based on DataGraft, a cloud-based service portal for data transformations and data access.



INFRARISK GIS KB

Application and Impact

The methodology is to be used in all situations, e.g. different hazards, different consequences, different team expertise, different levels of computer support, and different amounts of time available.

The developed strategy provides all infrastructure managers a systematic way to evaluate their risks regardless of the situations in which they find themselves.

The methodology is ready to be implemented. For use in specific situations, however, detailed discussions with infrastructure managers need to take place before the specific development can enable them to systematically conduct their risk assessments.

Regulators will potentially benefit from the methodology as a support to help define stress tests to be run by critical infrastructure managers and operators.

The implementation of a stress testing strategy such as that developed in INFRARISK for the European Critical Infrastructure will allow:

- To associate the severity of a hazard/disruptive event with the potential impact on a system by defining the operation limits and the vulnerabilities
- To support the work of managers, stakeholders and policy makers through providing insight of the impact of such events
- To assess the limits of their infrastructure and systems in crisis, including the core part of the prevention and preparedness work (operators and sectoral associations).

More information and access to reports: www.infrarisk-fp7.eu

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At a glance:

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