At a glance

Title:

Harmonized approach to stress tests for critical infrastructures against natural hazards

Instrument:

FP7 - Collaborative Project

Total Cost:

3,975,006.00 €

EC Contribution:

3,000,000.00 €

Duration:

3 years (2013-2016)

Start Date:

01 October 2013

Consortium:

12 partners from 8 countries

Project Coordinator:

Prof. Domenico Giardini, ETH Zurich, Switzerland

Project Web Site:

http://www.strest-eu.org

Key Words:

Critical infrastructures, natural hazards, low probability high consequence events, disaster risk reduction, mitigation & adaptation, hazard & risk assessment, societal resilience, stress tests

European Commission

Natural Hazards

STREST

The challenge

Critical Infrastructures (CIs) provide essential goods and services for modern society; they are highly integrated and have growing mutual dependencies. Recent natural events have shown that cascading failures of CIs have the potential for multi-infrastructure collapse and widespread societal and economic consequences. Moving toward a safer and more resilient society requires improved and standardized tools for hazard and risk assessment of low probability-high consequence (LP-HC) events, and their systematic application to whole classes of CIs, targeting integrated risk mitigation strategies. Among the most important assessment tools are the stress tests, designed to test the vulnerability and resilience of individual CIs and infrastructure systems. Following the results of the stress tests recently performed by the EC for the European Nuclear Power Plants, it is urgent to carry out appropriate stress tests for all other classes of CIs.

Project Objectives

- Establish a common and consistent taxonomy of non-nuclear CIs;

- Develop a rigorous, consistent modelling approach to hazard, vulnerability, risk and resilience assessment of LP-HC events;

- Design a stress test framework and specific applications to address the vulnerability, resilience and interdependencies of CIs;

- Enable the implementation of European policies for the systematic implementation of stress tests.

Methodology

STREST focuses on earthquakes, tsunamis, geotechnical effects and floods, and on three principal CI classes: (a) individual, single-site, high risk infrastructures, (b) distributed and/or

Research and Innovation

geographically extended infrastructures with potentially high economic and environmental impact, and (c) distributed, multiple-site infrastructures with low individual impact but large collective impact or dependencies.
STREST works with key European CIs, to test and apply the developed stress test methodologies to specific CIs, chosen to typify general classes of CIs.

Expected Results

- Methods to harmonize the treatment of uncertainties and the mechanics of hazard assessment, with focus on the quantification of epistemic uncertainties and its effects on LP-HC hazard, the integration of regional versus site-specific hazards and near-source effects;

- Consistent quantification of the occurrence of LP-HC events (extremes, cascading effects) and schemes to introduce them in hazard and risk evaluations;

- Definition of appropriate measures to express aggregated probabilities of exceeding limit values across an extended footprint, taking into account the spatial correlation characteristics;

- Consistent taxonomy of different classes of CIs, to classify them in terms of common characteristics of vulnerability, possible consequences and resilience;

- Probabilistic models for the vulnerability and consequence assessment, designed to enable transferring from hazard to risk and evaluating the consequences of system failures extending much beyond direct damages to equipment and structures, involving cascading effects;

- Improvement of the present understanding and assessment of losses and resilience, at the level of single CI, CI system or society;

- Probabilistic structural and systemic performance models (stress tests) to determine the losses in CIs, and their susceptibility to cascading effects that may amplify these losses, as well as interdependencies among different CIs;

- European Reference Reports concerning the assessment and protection of CIs;

- Interactions with practitioners via the involvement of CI owners and stakeholder workshops.

Project Partners	Country
Eidgenoessische Technische Hochschule Zurich	CH
École Polytechnique Fédérale de Lausanne	CH
Basler & Hofmann AG, Ingenieure Und Planer	CH
Centro Europeo di Formazione e Ricerca in Ingegneria Sismica	IT
AMRA - Analisi e Monitoraggio del Rischio Ambientale SCARL	IT
Istituto Nazionale di Geofisica e Vulcanologia	IT
Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek - TNO	NL
Université Joseph Fourier Grenoble 1	FR
Aristotelio Panepistimio Thessalonikis	GR
Bogazici Universitesi	TR
Univerza v Ljubljani	SI
JRC -Joint Research Centre- European Commission	BE