SECOND EUROPEAN CONFERENCE ON EARTHQUAKE ENGINEERING
AND SEISMOLOGY, ISTANBUL AUG. 25-29, 2014

"GRECO-RISKS" HELLENIC NATURAL-HAZARDS RISK-MANAGEMENT SYSTEM (A REAL TIME OPERATIONAL PLATFORM)"

Vasiliki KOUSKOUNA[1], George KAVIRIS[2], Antonios POMONIS[3], Despina KALLIDROMITOU[4], Athanasia KASSELA[5], Marc BONAZOUNTAS[6], Kostas MAKROPOULOS[7], Kostas CHOLEVAS[8], Evangelos LAGIOS[9], Konstantinos KYRIAKOPOULOS[10], Georgios DRAKATOS[11], Vassilis SAKKAS[12], Pierfrancesco DELLINO[13], Georgios SAKKAS[14], Nikolaos SAKELLARIOU[15], Ioannis MISAILIDIS[16]

"Greco-Risks" is a new project funded by the Hellenic General Secretariat for Research and Technology in the framework of the National Strategic Reference Framework 2007-2013. The project will run in the period November 2013- June 2015 and it will deliver a Multi-Risk Geo-intelligent web-Platform integrating Risk Modules for 9 specific hazards, which constitute the prevailing risks threatening Greece: five geohazards (earthquake, tsunami, volcano, landslide, and ground deformation), forest fires, flash floods, adverse weather and industrial accidents. Modules use as input: (i) past hazard-specific observations/statistics and (ii) other GIS data in order to deliver Risk Maps. Risk Maps show the spatial variation of (a) hazard-intensity (b) vulnerability and (c) hazard impacts, incorporating the probability of occurrence of hazardous events. The project aims at producing a national multi-risk mapping platform and will contribute towards Risk Analysis and Risk Management at local and national level. The platform will also allow for the improvement and expansion of the analysis, the methods and the data used as science and technology advance.

"Greco-Risks" will act as an IT "umbrella" (Fig. 1) for the aforementioned Risk-Modules, offering Risk Analysis services via a user-friendly interface. The partners of the project consortium are included in Table 1:

[1] Assoc. Professor, Department of Geophysics, University of Athens, Greece, vkouskouna@geol.uoa.gr
[2] Lecturer, Department of Geophysics, University of Athens, Greece, gkaviris@geol.uoa.gr
[3] Director, Cambridge Architectural Research Limited, antpomon@ath.forthnet,gr
[4] Civil Engineer, MBA, EPSILON S.A., Greece, Greco-Risks@epsilon.gr
[5] Civil Engineer, MSc, EPSILON S.A., Greece, Greco-Risks@epsilon.gr
[6] Em. Professor, Civil Engineer, EPSILON S.A., Greece, Greco-Risks@epsilon.gr
[7] Em. Professor, Department of Geophysics, University of Athens, Greece, kmacrop@geol.uoa.gr
[8] Civil Engineer, Ministry of Networks and Infrastructure, kostasholevas@gmail.com
[9] Professor, Department of Geophysics, University of Athens, Greece, lagios@geol.uoa.gr
[10] Professor, Department of Mineralogy and Petrology, University of Athens, Greece, ckiriako@geol.uoa.gr
[11] Research Director, Institute of Geodynamics, National Observatory of Athens, Greece, g.drakat@noa.gr
[12] Research Fellow, Department of Geophysics, University of Athens, Greece, vsakkas@geol.uoa.gr
[13] Professor, Dip. Scienze Terra, Università degli Studi di Bari, Italy, pierfrancesco.dellino@uniba.it
[14] PhD Candidate, Department of Geophysics, University of Athens, Greece, sakkasg@geol.uoa.gr
[15] PhD Candidate, Department of Geophysics, University of Athens, Greece, nsakel@geol.uoa.gr
[16] PhD Candidate, Department of Geophysics, University of Athens, Greece, jmisail@geol.uoa.gr

Table 1. Partners of the "Greco-Risks" project

	Partner	Public Sector	Private Sector
1	National and Kapodistrian University of Athens (Seismological Laboratory, SLNKUA)	x	
2	**Epsilon SA (coordinator)**		x
3	University of Ioannina (Laboratory of Meteorology)	x	
4	National Centre of Scientific Research "Demokritos" (Integrated Systems Laboratory)	x	
5	General Secretariat of Civil Protection	x	
6	EFG Eurolife Insurance Company		x
7	ATESE Engineering Commercial Consulting Cooperation		x
8	DASYC SA		x

SLNKUA (Partner 1) carries out the project work associated with the five geohazards, i.e.: earthquake, tsunami, volcano, landslide and ground deformation. Each geohazard includes hazard, vulnerability and risk analysis. Epsilon SA carries out the work for the module of forest fires and cooperates with partner 3 for the module of flash floods and adverse weather. The ninth risk, i.e. industrial accidents, is addressed by Partner 8, while partners 5 and 6 contribute as end-users, set the user requirements and facilitate the testing of the Greco-Risks platform under real case-studies. Partner 4 addresses evacuation models (when disaster strikes), whilst Epsilon SA and partner 5 undertake also a consulting role. Epsilon SA and Partner 7 are responsible for the Greco-Risks webGIS Platform Integration, Deployment and Testing.

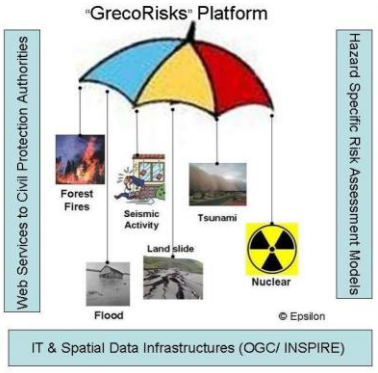

Figure 1. The "GrecoRisks" Project Concept

The "GrecoRisks" scientific and technological objectives are to:

- consolidate international best practices and justify innovative methodologies for (single/multi) Risk Assessment and Mapping in Greece for all project hazards (Risk Modules)
- collect/ harmonize input data for hazard analysis including past observations plus GIS ancillary datasets
- produce hazard-specific Intensity/ Risk Maps for 9 hazards and their probability of occurrence and
- address current technological barriers for geo-intelligent risk platforms, i.e. data modelling and interoperability.

In addition, "GrecoRisks" contributes towards a common terminology and shared understanding of concepts of Risk Analysis and aspires to contribute to the National Risk Assessment and Mapping Plan.

"GrecoRisks", which adopts interoperability standards that make the platform more powerful, introduces an innovative generic methodology for Risk Assessment and Mapping. The main advantages are that it delivers high spatial-analysis Risk Maps suitable for identifying elements at risk and that it supports multi-risk analysis overcoming barriers raised due to different terminology or definitions.

Details concerning the hazard methodology, as well as the vulnerability and exposure analysis of each geohazard are provided in Table 2. Elements at risk for all geohazards are grouped in two categories:

- building stock and infrastructure, including houses, public/commercial buildings, cultural heritage
- people (residents or travelers)

Table 2. Geohazards of the "Greco-Risks" platform

Risk Type	Example picture	Hazard Methodology	Vulnerability/Exposure
Earthquake		Probabilistic approach using Gumbel asymptotic distributions and the Extreme Values method to determine PGA and Imax	Building Type according to building material type, age and height mapped to the EMS-98 macroseismic intensity scale vulnerability classes (A to F). Estimation of vulnerability to ground shaking.
Volcano		Application of dispersal and gas diffusion models taking into account the wind vector. Analysis distinguishes between CO_2 emissions from magmatic degassing and thermal decarbonation	Development of an exposure database. Estimation of impact and failure probabilities of various types of structures to the various volcanic hazards occurring in Greece (e.g. tephra fall etc.)
Tsunami		Deterministic, tsunami simulations and tsunami inundation maps including maximum amplitudes and arrival times	Identification of municipalities exposed to tsunami. Identification and analysis of exposed elements (population and buildings classified according to their material, age and height). Estimation of their vulnerability based on impacts related to tsunami flow depth.
Landslide		Model development taking into account slope, geology, precipitation and the earthquake hazard analysis (see above)	Assessment and quantification in the scale of 0 to 1 (no damage to total destruction, respectively).
Ground Deformation		Model development taking into account amplitude of deformation, geology and the earthquake hazard analysis (see above)	Assessment and quantification in the scale of 0 (no damage to total destruction, respectively).

The spatial unit of analysis is defined by the current municipal administrative system of Greece (325 municipalities; the administrative structure was revised in 2011). Building stock information was extracted from the most recent National Census i.e. year 2001 (analysis to be updated when the data of the 2011 census becomes available). The concept of the analysis is to compile the basic knowledge about the geohazards occurring in each municipality along with the estimation of the vulnerability of the exposed elements of each municipality to enable the development of relevant deterministic geohazard scenarios and probabilistic risk (loss estimation) assessments.

ACKNOWLEDGMENTS

The present study has been conducted as part of the project "Greco-Risks - Hellenic Natural-Hazards Risk-Management System of Systems" which is jointly funded by Greece and the European Union, European Regional Development Fund (ERDF), National Action "Cooperation 2011 – Partnerships of Production and Research Institutions in Focused Research and Technology Sectors", (former) Ministry of Education, Lifelong Learning and Religious Affairs, Operational Programmes "Competitiveness and Enterpreneurship" (EPAN II) and Regions in Transition, National Strategic Regefence Framework NSRF 2007–2013.