



Network of European Research Infrastructures for Earthquake Risk Assessment and Mitigation

Report

D7.1 Identification of Key Players in European Building Inventory Collection

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1. Introduction

This deliverable summarises the research, background organization and thought process that went into the list of invitees to the NERA European Building Workshop, to be held in Pavia in May 2011. This workshop aims to allow the wider European community that have experience related to building inventory data to participate and contribute to the activities of Work Package 7 of the NERA project (Classification and inventory of European Building Stock).

The aim of this workshop is to understand the existing state-of-the-knowledge of buildings in Europe, in particular for what concerns their location and structural characteristics. This is to be achieved by bringing together experts that have used country-wide building inventories in public and private seismic risk applications, as well as representatives from national mapping and cadastre agencies, and partners that are directly involved in the Global Earthquake Model (GEM)¹, of which NERA is a regional programme.

The rationale behind the selection of invitees to the workshop, whose close participation in WP7 of NERA will be actively sought for the rest of the project, is described in the following sections. A list of the key players, their affiliation and country is provided in Appendix A.

2. Key Players in European Building Inventory

The “key players” concerned with European building inventories have been divided into the following main categories: NERA partners, European “academic” experts, Industry experts, GEM-related experts, related initiatives.

2.1 NERA Partners

The four main partners of the NERA project in WP7 are European Centre for Training and Research in Earthquake Engineering (EUCENTRE), the Cambridge Architectural Research Ltd (CAR), the Kandilli Observatory Earthquake Research Institute (KOERI), and Austrian Institute of Technology (AIT).

EUCENTRE is a private non-profit foundation that is a centre of competence for the Italian Department of Civil Protection (DPC) for what concerns seismic risk. A number of researchers at the EUCENTRE have been involved in seismic risk studies at a national level using building census data (e.g. Crowley et al. 2009), as well as at a local level using remotely sensed images (e.g. Borzi et al. 2011).

CAR is an independent consultancy which provides specialist advice for the construction industry and design professions and undertakes a broad range of research for policy-making institutions. They have developed a leading reputation for studies of the vulnerability of the building stock to natural hazards, particularly earthquakes. During recent years the group has been involved in the following major projects on seismic risk: Wellington Area Earthquake Casualty Assessment (for Accident Compensation Commission, New Zealand); Switzerland Earthquake Risk Assessment (for Willis Plc); GEVES: Global Earthquake Vulnerability Estimation System (for Partner Re); MEDEA Multimedia Manual for Earthquake Damage Survey (for DPC, Italy); Turkey Earthquake and Flood Recovery Project (for the Turkish Government); LESSLOSS: earthquake mitigation for earthquakes and landslides (EU FP6).

¹ www.globalquakemodel.org

KOERI is annexed to Boğaziçi University in 1983 and was given an institutional academic status and extended its activities into various observational fields with the main emphasis oriented towards earthquake research, education and relevant observational service activities. KOERI today has evolved into a multidisciplinary earthquake research organization providing graduate education in three departments namely Earthquake Engineering, Geophysics and Geodesy. In recent years, KOERI has produced a building inventory for Turkey for various seismic risk assessments, is leading the inventory development of the Middle East in the EMME project (www.emme-gem.org) and has developed a European building inventory database to be used for post-earthquake impact assessment within the European FP7 NERIES project (www.neries-eu.org; Demircioglu et al., 2009).

AIT are also coordinating WP6 of NERA which deals with the collection of field testing of buildings through dynamic in-situ investigations (ambient vibration, forced vibration methods) to obtain the dynamic characteristics of buildings which provides additional information that can be added to the inventory database to aid vulnerability assessment.

2.2 Academic Experts

A good coverage of European countries, in particular those with moderate to high seismic hazard, was a key requirement when identifying the key players. Researchers that have carried out seismic risk studies using national building inventories and those that have been actively involved in previous European projects related to seismic risk and earthquake engineering were identified.

Austria: representatives from AIT have access to data that has been extensively collected on buildings in Austria, and in particular in Vienna.

Cyprus: individuals from the Cyprus Institute of Technology have been collecting building inventory data as part of the EMME (Earthquake model of the Middle East) regional programme of GEM.

France: individuals at the University of Grenoble Joseph Fourier have combined remote sensing, field testing, and census data in the Rhones-Alpes region as part of the VULNERALP project (<http://www-lgit.obs.ujf-grenoble.fr/~pqueg/VULNERALP/>).

Greece: attributes of the Greek building stock have been obtained from the 2000 Greek Building Census by experts that took part in the World Housing Encyclopedia – Earthquake Engineering – PAGER project in 2007 (<http://pager.world-housing.net/>).

Italy: Seismic risk studies in Italy have been carried out using building census data in a number of national projects, including SAVE (http://gndt.ingv.it/Att_scient/Prodotti_attesi_2004/Dolce_Zuccaro/Mappe/Start2.htm) RELUIS (<http://www.reluis.it/>), and thus key representatives from these projects have been selected.

Macedonia: Representatives with experience in Macedonian buildings from the Department of Buildings, Structures and Materials - Analysis, Design and Testing of the Ss. Cyril and Methodius University in Skopje have worked with the partners of the NERA consortium.

Norway: NORSAR have carried out a number of seismic risk studies around the world, and have strong links to the World Housing Encyclopaedia, as one of their employees is the Associate Editor.

Portugal: LNEC is the National Laboratory of Civil Engineering and they have extensive experience in developing building inventory datasets in Portugal.

Romania: Recommendations on the participants to invite from Romania were obtained from the World Housing Encyclopedia – Earthquake Engineering – PAGER project.

Slovenia: Recommendations on the participant to invite from Slovenia was obtained from the World Housing Encyclopedia – Earthquake Engineering – PAGER project.

Slovakia: One of the NERA partners (AIT) works closely with colleagues in Slovakia and recommended experts to invite.

Spain: The partners of the consortium have worked in previous European projects related to structures and seismic risk (e.g. LESSLOSS) with researchers from Universitat Politècnica de Catalunya.

Switzerland: A representative formerly at the Department of Civil, Environmental and Geomatic Engineering at ETH Zurich was selected to provide information on the characteristics of Swiss buildings.

Turkey: KOERi (see Section 2.1)

2.3 Industry Experts

To complement the previous set of experts - that are mainly academic researchers from universities and research institutes in Europe that have worked with building inventory data for seismic risk studies - a number of industry experts were also identified, to combine the knowledge, expertise and strengths of both the public and private sectors.

AIR Worldwide: provider of risk modelling software and consulting services, can provide the perspective on how exposure databases are put together for cat risk modelling (www.air-worldwide.com).

Acord: the Association for Cooperative Operations Research and Development (www.acord.org) is a global, non-profit standards development organization serving the insurance industry and related financial services industries. They are developing standards for catastrophe exposure data.

Munich Re: a leading global reinsurer, have recently developed an Industry Exposure Database (insured assets) for windstorm Europe.

2.4 GEM-related Experts

The Global Earthquake Model is funding a number of international consortia to carry out global projects required to develop the global earthquake risk model (see <http://www.globalquakemodel.org/risk-global-components>). As NERA is a regional programme of GEM, it is necessary to ensure that there is close collaboration between the global components and the regional programmes early on in the development of the latter. Hence representatives from the global components of relevance to building a European Building Inventory will be invited to the workshop. These include GEM Ontology and Taxonomy, Global Exposure Database, Inventory Data Capture Tools, and Global Vulnerability Estimation Methods.

GEM Ontology and Taxonomy: This project foresees the development of a number of elements essential to the model. First of all, a technical communications and coordination program is developed to support exchange of knowledge and opinions

between various GEM collaborators, which can be sustained after GEM's first working program. This program is to support all other elements, such as definition of a set of concepts used in GEM and the relationship between them; a GEM ontology. Furthermore an initial GEM Taxonomy is to be developed that can be sustained in the future (i.e. a classification of things in an ordered system that reflects their relation). A beta version of a global building taxonomy has been developed by the consortium and will need to be presented to the workshop participants for feedback on the European applicability of the taxonomy, and to promote its use within WP7 of NERA.

Global Exposure Database: This project aims to create the first open database of global building stock and population distribution containing the spatial, structural, and occupancy-related information necessary for damage, loss and human casualty (estimation) models to be deployed in GEM. The consortium will start by building on existing databases (e.g. UN, regional and other public organizations, governmental building census data, national statistics) and published literature. It will then collect population and building stock data for at least the first level of sub-national boundaries for all countries of the world. The database should be able to incorporate data assembled using the Inventory Data Capture Tools. The consortium will furthermore devise and document a systematic and flexible approach for global application. Finally, an open data development environment is to be created for future modification and improvement of the database. WP7 of the NERA project is envisaged to provide a significant contribution to the European component of this database.

Inventory Data Capture Tools: This project has 2 main goals: a) to provide tools that will enable the capture and transfer of high- resolution inventory or damage data into either the Global Exposure Database or the Global Earthquake Consequences Database, and b) to develop tools to merge data collected using Remote Sensing with data acquired from Direct Observation. The tools developed within this component should enable data to be integrated into the Exposure DB and provide the attributes needed to assign assets to specific vulnerability classes. The tools should also allow for collection of post-earthquake damage and impact data in a form suitable for transfer into the Consequences DB. One of the advisory partners of this project is *Google Earth* and their representative within the IDCT consortium will be invited to the workshop to discuss any areas of possible collaboration.

Global Vulnerability Estimation Methods: The aim of this project is to provide standards for vulnerability estimation (i.e. the estimation of building damage, both structural and non-structural, and associated social and economic loss) using a number of different methods (empirical, analytical, expert opinion) and a range of measures of ground-motion intensity. The consortium will furthermore propose default vulnerability estimations using the standard methods for all earthquake-risk countries/regions in order to allow a global risk assessment to be carried out.

2.5 Related Initiatives

INSPIRE (<http://inspire.jrc.ec.europa.eu/>) is a directive of the European Union which has the objective of creating an EU spatial data infrastructure. There is a Task Working Group on the Theme of Buildings and a representative from this group will be able to provide information on the objectives and status of INSPIRE, and possibilities for collaboration.

Eurogeographics (www.eurogeographics.org) has a "Cadastre and Land Registry Knowledge Network" that has recently produced a Europe-wide cadastre inventory with information on buildings; a representative will be invited to discuss the type of information available in this database and to see if it can be of use to the European Building Inventory.

The PAGER group of the USGS (<http://earthquake.usgs.gov/eqcenter/pager/>) have developed a global building inventory (Jaiswal *et al.*, 2010) through a number of sources of data: UN-HABITAT census data, national census data, expert opinion, published articles, detailed inventory datasets. They are also a partner of the GEM Global Exposure Database consortium and thus will be invited to attend for both reasons.

3.0 European Coverage

Figure 1 shows the European countries that will be covered by the participants at the NERA European Building Inventory Workshop. Figure 2 shows a recent hazard map calculated for Europe (Grünthal *et al.*, 2010), where it can be seen that there is a strong correlation between the countries represented in the list of experts and those with the highest levels of hazard.

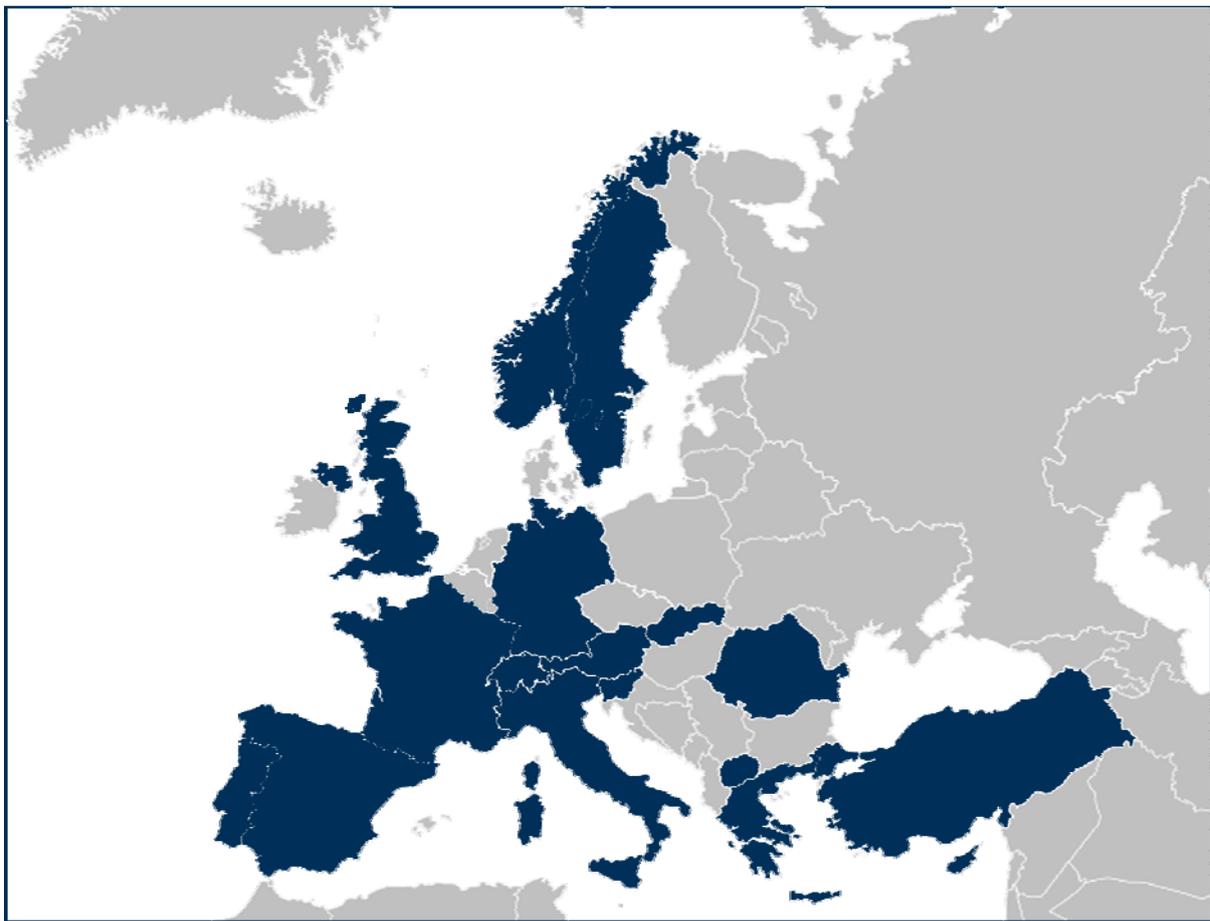


Figure 1. Representation of European countries in the key partners

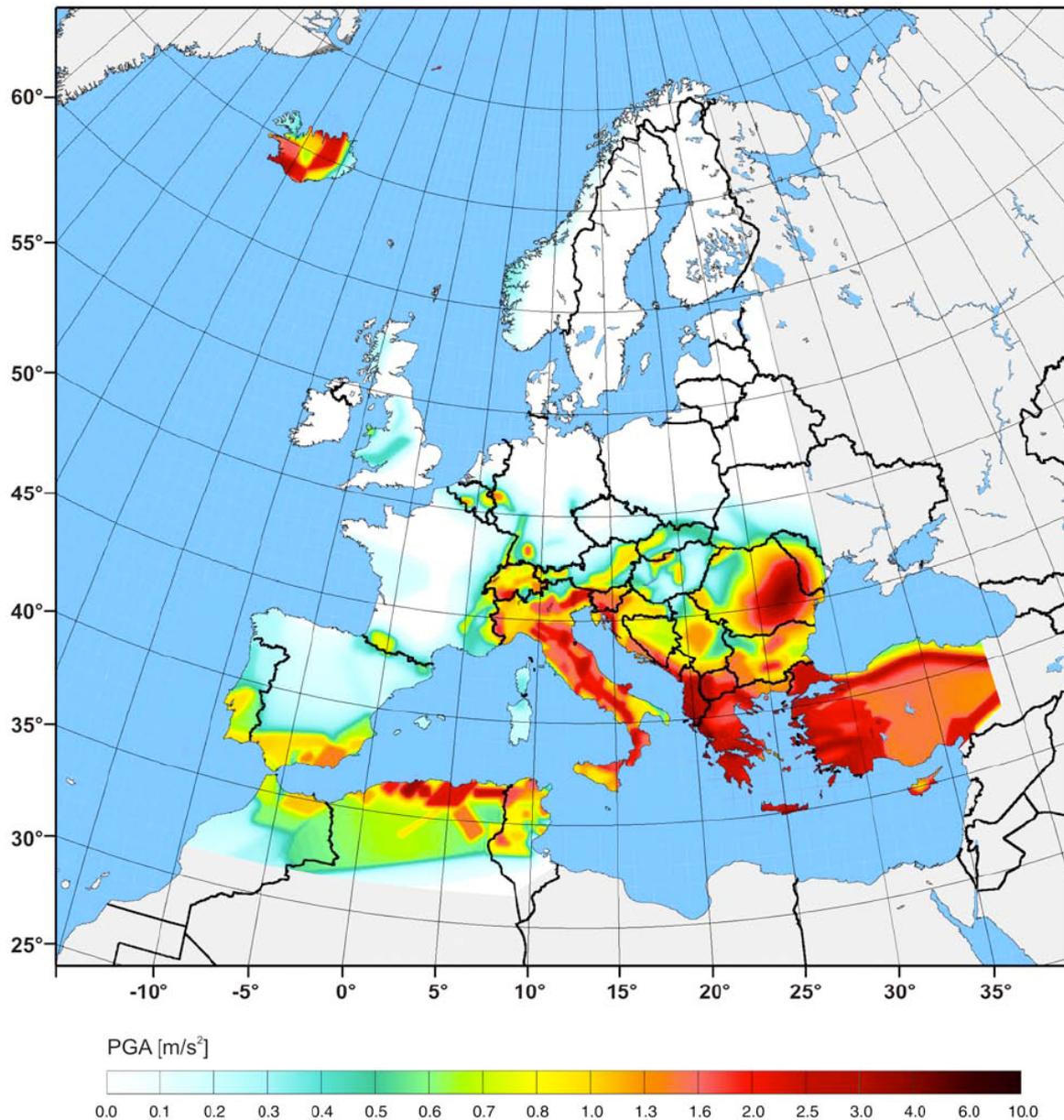


Figure 2. Hazard map for Europe (Grünthal *et al.*, 2010)

4.0 Closure

This deliverable explains some of the reasoning and thought process behind the selection of individuals to involve in the first workshop (and subsequent activities) of NERA Work Package 7, Classification and inventory of European Building Stock. There are obviously many more experts in Europe that should be involved in these activities, and the NERA partners will continue to seek ways in which others can be involved, for example through future workshops and online tools.

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Appendix A

Surname	Name	Affiliation	Workshop participant?	Country
Alten	Karoline	AIT	X	Austria
Aydinoglu	Nuray	BU-KOERI	-	Turkey
Barbat	Alex	University of Catalonia	X	Spain
Bazzurro	Paolo	AIR Worldwide	X	USA
Bevington	John	ImageCat Inc	X	UK
Brzev	Svetlana	Formally World Housing Encyclopaedia	X	USA
Campos Costa	Alfredo	LNEC	X	Portugal
Chrysostomou	Christis	Cyprus University of Technology	-	Cyprus
Colombi	Miriam	GEM Foundation	X	UK/Italy
Crowley	Helen	EUCENTRE/GEM Foundation	X	Italy
D'Ayala	Dina	University of Bath	X	UK
Dazio	Alessandro	ROSE School/IUSS	X	Switzerland
Ehrlich	Daniele	Joint Research Centre	X	Italy/Europe
Erdik	Mustafa	KOERI	X	Turkey
Ernst	Julius	Cadastral Agency of Austria (BEV)	X	Austria
Foulser-Piggot	Roxane	CAR Ltd	X	UK
Friedl	Herbert	AIT	-	Austria
Gamba	Paolo	University of Pavia	X	Italy
Goretti	Agostino	Department of Civil Protection	-	Italy
Gueguen	Philippe	Grenoble	X	France
Hancilar	Ufuk	Joint Research Centre, Ispra	X	Turkey
Hausmann	Peter	Swiss Re	X	Switzerland
Hollnack	Dirk	Munich Re	X	Germany
Jaiswal	Kishor	USGS/PAGER	X	USA
Kappos	Andreas	Aristotle University of Thessaloniki	X	Greece
Kjellson	Bengt	Eurogeographics - Casastre and Land Registry Knowledge Network	-	Sweden
Kyriakides	Nicholas	Cyprus University of Technology	X	Cyprus
Lang	Dominik	NORSAR	X	Norway
Lungu	Dan	National Institute for Building Research	X	Romania
Lutman	Marjana	National Buildings And Civil Engineering Institute of Ljubljana	X	Slovenia
Magistrale	Harold	FM Global	X	USA
Masi	Angelo	University of Basilicata	X	Italy
Modaressi	Hormoz	BRGM	-	France
Monteiro	Ricardo	EUCENTRE	X	Italy
Parsons	Ed	Google Earth	X	UK
Pinho	Rui	GEM Foundation	X	Portugal
Pomonis	Antonios	CAR Ltd	X	Greece
Ralbovsky	Marian	AIT	X	Austria
Saito	Keiko	CAR Ltd	X	UK
Scawthorn	Charles	AGORA	X	USA

Schmieder	Jutte	Munich Re	X	Germany
Sendova	Veronika	IZIIS	X	Macedonia
Sesetyan	Karin	KOERI	-	Turkey
Silva	Vitor	GEM Foundation	X	
Sokol	Milan	University of Bratislava	X	Slovakia
Spence	Robin	CAR Ltd	X	UK
Stempniewski	Lothar	Karlsruhe Institute of Technology	-	Germany
Tashkov	Ljubomir	IZIIS	X	Macedonia
Taucer	Fabio	Joint Research Centre, Ispra	X	Italy/Europe
Tenerelli	Patrizia	Joint Research Centre, Ispra	X	Italy/Europe
Tuzun	Cuneyt	KOERI	X	Turkey
Vacareanu	Radu	National Institute for Building Research	X	Romania
Wenzel	Friedemann	CEDIM	-	Germany
Wyss	Max	WAPMERR	X	Switzerland
Zuccaro	Giulio	University of Naples	X	Italy