# Global Earthquake Model:

Calculating and communicating seismic risk



2 the business of providing 3 money paid for insurance, or a tion under an insurance policy. 4 viding protection against eventuality.

insure overb 1 arrange for comp the event of damage to or loss of (p or a person), in exchange for regul to a company. 2 secure the payme in this way. 3 (insure against) p one) against (a possible eventualit term for ENSURE.



Name Affiliation

### **KEY FEATURES**

GEM is a internationally sanctioned programme - initiated by the OECD - that aims to build an independent, open standard to calculate and communicate earthquake risk around the world.

Implementation is based on a combination of national, regional and global elements, and will integrate developments on the forefronts of scientific and engineering knowledge as well as IT processes and infrastructure.

- GEM is dynamic: an updatable and 'pluggable' model, not a map
- GEM is truly global: it also covers less developed/monitored and will set uniform standards throughout the world
- GEM is open access: a (transparent) tool to use for everybody
- GEM is a public-private partnership: a non-profit foundation that combines the strengths (and objectives) of both the public and the private sector
- GEM is state-of-the-art: leading experts in all displines involved are working together on its development

### GLOBAL INVOLVEMENT



The construction of the Global Earthquake Model is a cooperative public-private endeavour, and GEM is therefore structured as a partnership among country governments (f.e. Singapore, Switzerland and Italy), private organisations, research institutions, international organisations f.e. World Bank, UN/ISDR, UNESCO, OECD) global risk initiatives, NGOs and individuals.

Experts and institutions across the entire globe are involved in GEM

### BUILDING GEM

The GEM scientific framework serves as the underlying basis for constructing the model, and is organised in three principal integrated modules:

![](_page_3_Figure_2.jpeg)

- The hazard module will calculate harmonised probabilities of earthquake occurrence and resulting shaking at any given location.
- The risk module will calculate damage and direct losses resulting from this damage such as fatalities, injuries and cost of repair. Damage due to strong ground shaking is calculated by combining building vulnerability, population vulnerability and exposure. GEM will furthermore develop remote-sensing and crowd-data collection techniques to classify, monitor and regularly update building inventory and thus regional vulnerability.
- The socio-economic impact module will provide tools and indices to both estimate and communicate the impact from earthquakes on the economy and society; in particular on indirect losses. For example the impact on a company's revenue, on budgets, or on poverty. The module will allow for calculations of scenarios that enable cost/benefit analysis of mitigating actions, such as systematic building strengthening, and facilitate insurance and alternative risk transfer.

### BUILDING GEM

It will take five years to build the first working global earthquake model and its accompanying software and tools. The work started in 2009 and at the end of 2013 the first version of a truly global and comprehensive earthquake model will be presented. The global earthquake model is constructed by means of various 'building blocks'. These components together ensure that a uniform and independent standard for global earthquake risk assessment will be established:

- **GEM1**: A pilot project [1.1.2009-31.3.2010] to develop the initial model infrastructure and GEM's first preliminary products.
- **Global Components**: The scientific modules of GEM that are developed at a global scale to provide standards, models, tools and data. Addressed by international consortia that respond to Requests for Proposals (RfPs) released periodically by the Scientific Board.
- **Regional Programmes**: Independent projects that sign a cooperation agreement with GEM, agreeing to trial and test the standards and software from the global components, providing necessary feedback and data.
- **Executive Committee**: Includes experts in hazard, risk, socio-economic impact, and IT. Coordinate the integration of output from the global components and regional programmes into the model.
- **GEM Model Facility**: Assembles and maintains global and regional data, provides capability to compute, analyse and communicate global seismic hazard, risk and socio-economic impact estimates.

### RESULTS

**GEM** 

## Promising progress has been made over the course of one year, due to the active participation and efforts of the entire GEM community:

- In June 2010 a blueprint of GEM's Computational Infrastructure (the OpenGEM system) will be ready, as well as preliminary (state-of-the-art) global hazard and risk maps, plus several exemplificative risk applications. Furthermore a worldwide inventory of existing regional hazard models and a number of global databases for risk will become available, and the results of a user needs assessment [see also next slide].
- The Global Components will establish a common set of definitions, standards, quality criteria and formats for the compilation of databases that are input to the model, and a first global compilation of relevant data. The work for the Hazard Global Components will start soon, proposals can be handed in until 18 March 2010 for the Risk Global Components and the roadmap for the Socio-Economic Impact Global Components will undergo public commenting in the spring of 2010.
- Several Regional Programmes have started (Europe, East Mediterranean/Middle East) and others are being defined at the moment in Africa, South America, South, South East, Central and North East Asia, to ensure that uniform standards are created, that detailed data goes into the model, that experts from all over the world are involved and that local capacity is built.

![](_page_5_Figure_6.jpeg)

The GEM Model Infrastructure is put in place as we speak. It is the organisational structure that brings together the technical input from GEM's Global Components and Regional Programmes with the IT capacity of GEM's Model Facility (MF), coordinated by the Executive Committee (a component of the GEM Secretariat) in order to develop an open source, dynamic, uniform, Global Earthquake Model.

### FURTHER INFORMATION

![](_page_6_Picture_1.jpeg)

Global Earthquake Model

![](_page_6_Picture_3.jpeg)

#### GEM Outreach Meeting 2010 [1-4 June]

Interactive demonstrations and presentations of GEM's first products as proof-of-concept; overview of all the components that comprise GEM.

#### Website

#### www.globalquakemodel.org

#### Booklet

Available from website and in paper

Updated version available from June 2010

#### **Bi-monthly e-Newsletter**

Register online