

## GEM REQUEST FOR PROPOSAL: GLOBAL EARTHQUAKE CONSEQUENCES DATABASE

Posting date: 18<sup>th</sup> January 2009  
Submission deadline: 18<sup>th</sup> March 2010  
Expected decision: July 2010  
Target budget range: 700k Euros  
Timescale: 36 months

### PREAMBLE

To support the development of tools for vulnerability assessment, GEM plans to create a global database of earthquake impacts and consequences. The aim is to assemble and store in a structured and web-accessible way both data (including photographs) already acquired and data yet to be acquired following future events that show the consequences of earthquakes, including building damage, damage to lifelines and other infrastructure, ground failure, human casualties, social disruption, and financial and economic impacts.

The database should also include analytical tools to enable data fields to be subjected to post-processing across events, globally or within regions. To achieve this, each element of damage recorded will be geographically referenced, and its location and class of data will be shown on a global mapping system (such as Google Maps).

The tasks to be performed are:

- To create the structure of the database and its analytical tools,
- To populate it with a significant sample of data of each class from a number of events,
- To carry out some cross-event analyses to demonstrate this capability,
- To prepare a searchable literature database,
- To prepare an interface that will enable impact damage from future earthquakes to be captured and uploaded to the database,
- To prepare a User's Manual.

### TASKS

#### ***Task 1. Develop Database Structure***

Create a database structure capable of storing in an appropriate way the many classes of data listed above; the database should be web-accessible to all users to view and search the data; and selected users may be provided privileged access to assemble and download existing data, and to upload new data. Locations of each earthquake event should be documented, and each damage observation should be viewable on a freely available mapping system (such as Google Maps). The database should be able to incorporate links with other relevant on-line databases (e.g. DesInventar) and catalogues.

#### ***Task 2. Assemble List of Events***

Assemble a list of earthquake events for which consequence data is available (and where possible ensuring a wide distribution around the globe), with uniformly defined source parameters, and create a process to overlay maps of ground shaking levels, e.g. ShakeMaps, in terms of a wide range of ground motion parameters.

#### ***Task 3. Assemble Data***

Devise a data structure and assemble earthquake consequence data of the following types:

- Statistical data on building damage by event, study, and location, in the form of tables of numbers of buildings at different damage levels (structural and non-structural) for different classes of buildings, using GEM taxonomy for what concerns damage levels and building classifications, and ensuring the numbers of undamaged buildings are also recorded (50+ earthquakes)
- Statistical data on human casualties by event, study and location in the form of tables of numbers dead and injured using GEM taxonomy for what concerns injury levels and total population (20+ earthquakes)
- Observational data on nonstandard building types, critical buildings, infrastructure e.g. roads, railways, bridges, tunnels, dams, underground pipelines, and urban systems, etc. with descriptions, damage photographs (including remotely-sensed images), and locations to enable their display on maps and linkage

- to levels of ground shaking, and to more detailed reports (25+ earthquakes)
- Observational data on ground failures, i.e. landslides, fault ruptures, liquefaction, and induced effects such as tsunamis and fire following, with descriptions, photographs and locations to enable their display on maps and linkage to levels of ground shaking and to more detailed reports (25+ earthquakes)
- Data on social disruption (homelessness, recovery) and economic data; mount a few examples of such data (5+ earthquakes).

Within this task the aim should be to assemble data adequately distributed so as to include consequence data from the world's most important tectonic zones, and to include data from at least some pre 1970 events.

#### **Task 4. Develop Tools for Cross-event Data Analysis**

Develop analytical tools to enable cross-event analyses of performance of each class of element damaged to a given damage level and ground shaking; and provide examples of the application of these tools for each type of damaged element.

#### **Task 5. Literature Database**

Prepare a searchable literature database for more detailed published information on consequences of specific earthquake events and class of element. Searchable by: event, region, types of data recorded etc.

#### **Task 6. User Documents**

- Develop a preferred protocol that can be used for the collection of impact data from future earthquakes, describing also how to upload the resulting damage data into the database. This task should include a review and assessment of existing protocols for collecting impact data in different countries to identify their commonalities, strengths and weaknesses and include a process to obtain international agreement to the proposed GEM protocol. This task will need to be carried out in collaboration with the Inventory Data Capture Tools consortium.
- Develop a User Manual to support web access and use of the database and its analytical tools.

### **PROJECT MANAGEMENT AND QUALITY ASSURANCE PLAN**

The Project Management Plan should include:

- How linkages will be maintained with the consortia working on GEM Ontology and Taxonomy and Global Vulnerability Estimation Methods and with the GEM Regional Programmes,
- How the information stored in the database will be reviewed checked or validated,
- How uncertainty in the damage and location data will be evaluated and presented to users,
- How the database will be managed and extended beyond the lifetime of the current project,
- How training and capacity building within the potential GEM user community will be enhanced through this global component.
- A detailed account of how the bidding consortium ensures quality in its execution of contractual obligations.