

**GEM Request for Proposal: Global Ground Motion Prediction Equations**

**Posting date:** 15 May 2009  
**Submission deadline:** 15 July 2009  
**Expected Decision:** 15 September 2009  
**Target budget range:** 400,000€  
**Target duration of project:** 24 months

GEM aims at enabling the assessment of seismic hazard at global, regional and national scale, with a harmonized and methodologically unified approach. A source of variability in hazard results obtained in small regions has traditionally been the derivation and use of local attenuation models often based on insufficient data. Another factor influencing the variability of hazard results is the large statistical uncertainty of ground motion predictions; in recent years, a number of promising advances have been made – i.e. the Next Generation Attenuation (NGA) models – allowing to correctly accounting for the effect of site conditions on ground motion predictions. With the goal of compiling a global reference hazard assessment model, GEM seeks to develop a harmonized suite of ground motion prediction equations (GMPE), built on the most recent advances in the field.

Local soil conditions have a large influence on the seismic ground motions. This includes the amplification of ground shaking amplitudes as well as frequency content of the seismic waves. A reliable computation of damage grades and of the resulting losses for the assessment of earthquake risk requires at least a basic knowledge of the soil conditions. GEM aims at adopting a unified strategy to determine seismically effective soil parameters (preferably the S-wave velocity) on a worldwide level, and to represent the spatial distribution of soil classification, as for example proposed by NEHRP or EuroCode8, compatible with the GMPE models.

Specific tasks and deliverables expected for this project include:

T1. Define a consistent strategy and methodological approach to model ground motion in areas of different tectonic regimes and different rate of earthquake occurrence, and to characterize rock conditions and soil classes, compatible with existing classification schemes (i.e. NEHRP and EuroCode8). Deliver this strategy within 12 months of the start of the project.

T2. Compile and critically review recent GMPE models, including NGA-type models, with the aim of building a global compilation.

T3. Select or derive a global set of GMPE models to cover the main tectonic environments. Specify the distance metrics, the focal depth differentiation in subduction and continental environments, the reference rock conditions, the tectonic setting differentiation and the magnitude reference scale ( $M_w$  preferred). Of particular importance is the characterization of uncertainties. The resulting GMPEs shall cover the widest possible spectral range and be given in spectral response acceleration, velocity and displacement; they may be provided in parameterized or tabulated form.

T4. Derive a set of specific Ground Motion Prediction Equations to address the issue of near-fault strong ground motions, incorporating observations and simulations as required.

T5. Build a database of recorded waveforms to cover the specifications of the global suite of GMPE, to enable the extraction of waveforms corresponding to the main hazard contributors.

T6. Design the specifications to compile a global database of geological soil classification (i.e. OneGeology) compatible with the global attenuation models.