The 2013 SHARE (Seismic Hazard Harmonisation in Europe) model

SHARE was a project aimed at the construction of a harmonised and consensual hazard model for Europe. The SHARE project was sponsored by the European Union under the Seventh Framework Programme for Research (FP7). The resulting European Seismic Hazard Model (ESHM13) was the first GEM regional programme to be completed. Information about the SHARE model can be found in Giardini, D. et al, 2014 and the SHARE website.

Basic Datasets

The SHARE project produced a large set of databases indispensable for the construction of a PSHA input model. Most of these databases contribute to provide - for the first time - a homogeneous view of the earthquake process across Europe. Below we provide a very short description and some references regarding these databases.

Earthquake catalogues

The catalogue used to calculate activity rates for most of the seismic sources included in the SHARE PSHA input model is the SHEEC catalogue downloadable from the EFHER website. SHEEC is a catalogue developed by combining two main components:

- The first component covers the period between 1000 and 1899 (Stucchi et. al., 2012)
- The second component covers the period between 1900 and 2006 (Grünthal et al., 2013)

Active fault database

The European Database of Seismogenic Faults (EDSF) is the first comprehensive database of active faults prepared for the European continent (Basili et al., 2013). The interactive active faults database is accessible on the EDSF website . A catalogue of active faults is available on the EFEHR website

Strong ground motion database

SHARE created a parametric strong motion database. It contains recordings of earthquakes that occurred globally between the 1930s and 2009 for a total of 2448 events and 14193 records. The parametric database can be downloaded from the EFEHR website.

The Seismic Source Model

The SHARE seismic source model consists of three backbone models:

- An area source based model
- A model which combines faults with background sources (FS-BG)
- A model obtained by smoothing seismicity using the approach proposed by Hiemer et al. (2013)

The map below shows the annual occurrence rate per source (between minimum and maximum magnitudes) for the different source models included in the SHARE model. Click the *show map layers* icon to view different source models and base layer maps.

Total occurrence rate
(number of events / year)

- < 1e-6
- 1e-6 - 1e-5
- 1e-5 - 1e-4
- 1e-4 - 1e-3
- 1e-3 - 1e-2
- 1e-2 - 1e-1
- 1e-1 - 1
- 1 - 10
- >= 10

.my-legend .legend-title { text-align: left; margin-bottom: 5px; font-weight: bold; font-size: 80%; } .my-legend .legend-scale ul { margin: 0; margin-bottom: 5px; padding: 0; float: left; list-style: none; } .my-legend .legend-scale ul li { font-size: 80%; list-style: none; margin-left: 0; line-height: 18px; margin-bottom: 2px; } .my-legend ul.legend-labels li span { display: block; float: left; height: 16px; width: 30px; margin-right: 5px; margin-left: 0; border: 1px solid #999; } .my-legend .legend-source { font-size: 70%; color: #999; clear: both; } .my-legend a { color: #777; }

The Ground Motion Model

The SHARE project developed a complex logic tree for ground-motion prediction equations (GMPEs) which takes into account the major tectonic regions in Europe as well as the most recent GMPEs. The process adopted for the selection of GMPE is described in Delavaud et al. (2012).

For each tectonic region, the model considers multiple ground motion prediction equations organised in a logic tree structure to account for epistemic uncertainties.

Active Shallow Crust	**Weight**
Periods lower or equal to 3s	
Akkar and Bommer, 2010	0.35

Cauzzi and Faccioli, 2008	0.35
Zhao et al., 2006	0.10
Chiou and Youngs, 2008	0.20
Periods higher than 3s	
Cauzzi and Faccioli, 2008	0.5
Chiou and Youngs, 2008	0.5

Stable continental regions	**Weight**
Shield	
Campbell, 2003	0.5
Toro, 2002	0.5
Continental crust	
Campbell, 2003 (adjusted to 800 m/s)	0.2
Toro, 2002 (adjusted to 800 m/s)	0.2
Akkar and Bommer, 2010	0.2
Cauzzi and Faccioli, 2008	0.2
Chiou and Youngs, 2008	0.2

Subduction	**Weight**
Interface	
Zhao et al., 2006	0.4
Atkinson and Boore, 2003	0.2
Youngs et al., 1997	0.2
Lin and Lee, 2008	0.2
Inslab	
Zhao et al., 2006	0.4
Atkinson and Boore, 2003	0.2
Youngs et al., 1997	0.2
Lin and Lee, 2008	0.2

Volcanic	**Weight**
Faccioli et al., 2010	1.0

Vrancea	**Weight**
Youngs et al., 1997	0.40
Lin and Lee, 2008	0.60

Hazard Results

The figures below show examples of results computed with the SHARE model.

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Model Summary Table

This table summarises the main characteristics of the original implementation of this model

1	**Datasets availability**	
1.1	Earthquake catalogue	Available (see the Basic Datasets section)
1.2	Geological database	Available (see the Basic Datasets section)
1.3	Strong-motion database	Available (see the Basic Datasets section)
1.4	Site characterization database	Not Available
Notes		
2	**Methodology for model development**	
2.1	Scientific participation (SSHAC levels) and review process	Level 3
2.2	Documentation describing model preparation	Partially available
2.3	Codes used for model preparation	Not Available
Notes		

3	**PSHA input model**	
3.1	**Seismic Source Model**	
3.1.1	Area sources	YES
3.1.2	Grid sources	YES
3.1.3	Crustal faults	YES
3.1.4	Subduction faults	YES
3.1.5	Non-parametric ruptures	NO
3.1.6	Magnitude-area scaling relationships	Wells and Coppersmith (1994)
3.2	**Ground Motion Model**	
3.2.0	Tectonic regionalisation	Available
3.2.1	Models for active shallow seismicity	YES
3.2.2	Models for subduction interface	YES
3.2.3	Models for subduction intraslab	YES
3.2.4	Models for stable continental regions	YES
3.2.5	Models for deep non-subduction sources	YES
3.2.6	Models for volcanic areas	YES
3.3	**Site Response Model**	
3.3.1	Based on GMPEs	YES
3.3.2	Based on site-response analysis	NO
3.4	**Epistemic uncertainties**	
3.4.1	Seismic Source Model	Included
3.4.2	Ground Motion Model	Included using a logic tree (see the ground motion model section)
3.4.3	Site Response Model	Not included
Notes		
4	**Hazard Input Description**	
4.1	Hazard input document	Not Available
4.2	Input files	Available
Notes		
5	**Calculation**	
5.1	Software	OpenQuake-engine, available here
5.2	**Results**	
5.2.1	Hazard curves	Available
5.2.2	Hazard maps	Available
5.2.3	Uniform hazard spectra	Available
5.2.4	Disaggregation	Not Available
5.2.5	Stochastic event sets	Not Available
5.2.6	Ground motion fields	Not Available
Notes	All the results are available on the European Facility for Earthquake Hazard and Risk website	
6	**Download oq-engine input model (NRML format) - Please read the license and disclaimer attached to the model**	
Link	Not available	