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# Table of Contents

- 1. Introduction ..... 3**
  - 1.1 Purpose ..... 3**
  - 1.2 Scope ..... 3**
  - 1.3 Glossary..... 4**
- 2 System overview ..... 6**
  - 2.1 Functional overview ..... 6**
  - 2.2 Architecture overview ..... 7**
- 3 Design Considerations of the portal..... 9**
  - 3.1 Accessibility ..... 9**
  - 3.2 Integration ..... 9**
  - 3.3 Data interoperability and exchange..... 9**
  - 3.4 Customization and access control..... 9**
- 4 System Architecture ..... 12**
- 5 Policies ..... 14**
  - 5.1 Presentation Tier: The PORTAL..... 15**
  - 5.2 Usecase: Project Information ..... 16**
  - 5.3 Usecase: Hazard Map Portlet (HMP) ..... 18**
  - 5.4 Usecase: Hazard Curve Portlet (HCP) ..... 22**
  - 5.5 Usecase: Hazard Spectra Portlet (HSP) ..... 24**
  - 5.6 Usecase: Disaggregation (HDisP) ..... 27**
  - 5.7 Usecase: Data Viewer Porlet (DVP) ..... 27**
  - 5.8 Optional Usecases..... 27**
    - 5.8.1 Usecase: Data Submission (DSP)..... 27
    - 5.8.2 Usecase: Request Data and Services (RDSP) ..... 28
    - 5.8.3 Usecase: System Administration ..... 28
    - 5.8.4 Usecase: Networking ..... 29
    - 5.8.5 Usecase: Hazard Calculations..... 29
- 6 Detailed Portal design..... 30**
  - 6.1 System design..... 30**
  - 6.2 Portal design ..... 31**
  - 6.3 Corporate Identity..... 31**

## **1. Introduction**

SHARE is a Collaborative Project in the Cooperation programme of the Seventh Framework Program (FP7) of the European Commission (EC). The main objective of SHARE is to provide an updated, living seismic hazard model for the Euro-Mediterranean region. The project aims to establish new standards in Probabilistic Seismic Hazard Assessment (PSHA) practice by a close cooperation of leading European seismologists and engineers and, in particular, to employ state-of-the art Information Technology (IT) to disseminate the data and results to expert and interested non-expert users such as the media and general public.

SHARE will deliver measurable progress in all steps leading to a harmonized assessment of seismic hazard - in the definition of engineering requirements, in the collection of input data, in procedures for hazard assessment, and in engineering applications. SHARE will cover the whole European territory, the Maghreb countries in the Southern Mediterranean and Turkey in the Eastern Mediterranean.

Access to data and results will be granted to the public and specialist through a single entry point, the SHARE Portal ([www.share-eu.org](http://www.share-eu.org)). In addition, SHARE as a core regional initiative of the Global Earthquake Model (GEM) ensures full technical compatibility with the GEM Portal by using the same standard open-source technology. In close cooperation with leading European institution such as the EMSC, we ensure compatibility so that portlets are able to be served in various portals. The IT-infrastructure uses open-source technology and is embedded in a highly dynamic environment which may be subject to changes in the parts of the implementation during the project duration.

### **1.1 Purpose**

This document provides the detailed design specifications of the SHARE Portal

### **1.2 Scope**

The scope of this document is to describe the specification and the implementation of the SHARE Portal. The portal will serve as the central access point for the project. The requirements for the design of the portal are guided to ensure a user-friendly interface for users with all levels of skills, fast performance and high availability:

1. the portal shall be modular, highly scalable, extensible, and flexible as needs develop over time;

2. the portal can be easily customized to provide the general public, scientists and engineers, policy makers, and other users with appropriate data and access given their different roles;
3. the portal can be used to interconnect with other relevant projects and institutions such as GEM, NERIES, SERIES, SYNER-G, GEISIR, EMSC, OneGeology and others via shared portlets and back-end Web services (see [www.seismicportal.eu](http://www.seismicportal.eu));
4. the portal will provide access to all data sets, model definitions, data schemata, reports, and other project products via any standard Web browser without the user to know where the products themselves are held.

### 1.3 Glossary

Term definition for technical expressions:

Term	Definition
SDD	Software Design Document
ROI	Return Of Investment
FOSS	Free Open Source Software
SOA	Service Oriented Architecture
ORM	Object Relation Mapping
UI	User Interface
GUI	Graphical User Interface
VM	Virtual Machine
GA	General Availability
RC	Release Candidate
OASIS	Organization for the Advancement of Structured Information Standards
WMS	Web Map Service, an OGC standard to provide localized imagery for mapping purposes over a web service, along with specified metadata
WFS	Web Feature Service
KML	“Keyhole Markup Language”, an XML dialect introduced by Google to describe vectorbased and rasterbased geodata. Compared to GML, KML concentrates on visualization, while GML allows for generic object properties.
GML	“Geography Markup Language”. An XML dialect of the Open Geospatial Consortium and ISO to describe spatial data along with sensor- or measurement data. GML is used e.g. for WFS payloads.
WEB Service	A web based data or functionality service identified by a uniform resource identifier (URI), and described in its capabilities by an XML (WSDL) document.
Portlet	A portlet is a software component that produces a part of a user interface e.g. as html code, for display by a portal server in a portal. Portlets following the JSR 168 and JSR 268 standards are deployable in most existing portal servers, and allow standardized inter-portlet communication (JSR 268)
OGC	“Open Geospatial Consortium”, an NGO invested in standardisation and interoperability of spatial information and related service

JSR	Java Specification Request
REST	Representational State Transfer

**Table 1: Term definitions.**

Abbreviations for projects, initiatives, and institutions:

<b>Term</b>	<b>Definition</b>	<b>Web presence</b>
EMME	Earthquake Model of the Middle-East	<a href="http://www.emme-gem.org">www.emme-gem.org</a>
EMSC	European-Mediterranean Seismological Center	<a href="http://www.emsc-csem.org">www.emsc-csem.org</a>
GEISIR	Geothermal Engineering Integrating Mitigation of Induced Seismicity in Reservoirs	<a href="http://www.geiser-fp7.eu">http://www.geiser-fp7.eu</a>
GEM	Global Earthquake Model	<a href="http://www.globalearthquake.com">www.globalearthquake.com</a>
NERA	Network of European Infrastructures for Earthquake Risk Assessment and Mitigation	
NERIES	Network of Research Infrastructures for European Seismology	<a href="http://www.neries-eu.org">www.neries-eu.org</a>
SERIES	Seismic Engineering Research infrastructures for European Synergies	
SYNER-G	Systemic Seismic Vulnerability and Risk Analysis for Buildings, Lifeline Networks and Infrastructures Safety Gain	<a href="http://www.vce.at/SYNER-G/">http://www.vce.at/SYNER-G/</a>

**Table 2: Abbreviations for related projects, initiatives and institutions.**

## 2 System overview

The SHARE project implements state-of-the-art and homogenized seismic hazard assessment approach to the Euro-Mediterranean area. The project aims to build a framework for a *living and openly accessible hazard model* that ensures 1) the capability to reproduce results of the hazard assessment and 2) a mechanism to update the hazard model in all aspects of the assessment: the data collection, the model building procedure, the hazard assessment software, the hazard results, and the user interfaces to manage data, run hazard calculations and view results, as an integrated system ready for validation, replication and modification in all its aspects.

The access to the SHARE model will be given through the Web-portal as the single access point presenting input data, output data and model results as required by seismological and engineering needs but also public needs. Some aspects of data management and hazard calculation have web-mounted user interfaces integrated in a portal.

This chapter provides a brief description of the overall IT infrastructure which the SHARE portal is part of. An extensive description is found in Deliverable D6.3.

### 2.1 Functional overview

The SHARE portal is the public interface of a complex system connecting databases of seismic hazard information with a computational engine for seismic hazard assessments. The portal provides the following minimum functionalities:

- authentication of the user and authorization for a user specific profile to accessible data and functionalities.
- browsing capabilities for the logic tree structure of released model versions, and of the definitions and results for each logic tree end path.
- access to hazard maps of Europe, calculated for different intensity measurement types (such as PGA, PGV, SA for different frequency bands) and return periods, for hazard models as well as for its individual logic tree branches.
- capability to browse site-specific hazard curves and hazard spectra, each for the hazard model as for its individual logic tree branches.

- view hazard input data (such as seismic source zone, earthquake catalog, ground motion prediction equations).
- enable the end-user to create summary fact sheets on the selected results (hazard map, curves, spectra).

Sharing the technical principles for data storage, middleware, data exchange formats, hazard assessment software, and front-end from the OpenGEM platform, SHARE has the principal option to manage input data, view hazard models, and trigger hazard calculation directly from the web front-end. The portal integrates the software standards of NERIES ([www.seismicportal.eu](http://www.seismicportal.eu)) and the future NERA portal and thus allows to mount portlets developed within these projects, and vice versa.

## **2.2 Architecture overview**

The SHARE portal integrates the OpenGEM platform principles and its software framework, and thus follows the same design principles:

1. A multi-tier service oriented architecture that allows for a spatial and organizational distribution of database/data access layer, application layer, and presentation layer.
2. Data and functionality access are provided via web services using open standards and allowing to integrate distributed providers to incorporate and provide different functionalities written in various programming languages, to processing oriented as well as presentation oriented consumers.
3. Data exchange is done using XML, thus allowing for human as well as machine readability, automated serialisation/deserialisation for any platform, representation of data on different levels of completeness, as well as local format extensions. Data and services follow common standards as far as available (e.g. existing openGIS standards WMS/WFS/GML for spatial data components); for specific geophysical data, newly developed community based XML data interchange formats such as QuakeML and ShaML are used.
4. All applications supply their presentation layer in portlets following the JSR 186/286 standards, allowing a) for an integrated display of applications from distributed providers, b) inter-portlet data exchange using the common xml formats, and c) integration with other portal-based developments of projects and institutions in the

earth-science and planetary sciences community (e.g. ORPHEUS, EMSC, GEM, NERA, etc) and beyond (e.g. oneGeology, NASA, etc.).



## **3 Design Considerations of the portal**

### **3.1 Accessibility**

SHARE seismic hazard information for the Euro-Mediterranean region will be publicly accessible to anybody, independently of operating system or specific client software. This is provided by an HTML-based portal (for human users and interactive access), and SOAP/REST web service based data and functionality access (for software-based interactions).

### **3.2 Integration**

Access to different services / functionalities will be served within a single portal. Components of this front-end are made available to other portal developments in the earth science and beyond. This is achieved by using interfaces as portlets following the JSR 186 and 286 standards.

### **3.3 Data interoperability and exchange**

Data can be exchanged between the software components (and their portlets) mounted to the SHARE portal, as well as with the outside world. This is achieved by new community-developed XML based data interchange formats for specific geophysical data (QuakeML, shaML), and the use of common open-standard formats and protocols for more general data types (e.g. GML, WMS and WFS for spatial data, SOAP directives for communication flow control, etc.).

### **3.4 Customization and access control**

Users are given access to functionalities according to their needs, and data according to its level of public availability. For this an authentication and authorisation layer is implemented on the functionality level (access to individual portlets) as well as on the data level (data visibility and editing permission based on a user/group/public model).

No	Domain	Technical standards
1	Portlets	JSR 168/268
2	Web services	Data services in ShaML/QuakeML: serialized XML as SOAP-payload
3	SHARE-internal code development	For best OO development, code encapsulation, reusability, and compliance with SOA and web technologies, SHARE-internal software development is done in JEE 1.6. using the spring framework. Third-party providers are encouraged to stick to the same standard, however, given the web service based architecture and data payloads in serialized XML, component development is possible on practically any platform.
4	Security and Access Level	loginID/password -based authentication is enforced in order to implement different access levels in data visibility, data editability, and functionality access.
5	Spatial data	Map data is provided over OGC WMS and WFS; spatial aspects of shaML are represented as GML objects.

**Table 3: Domain term definitions and the applied technical standards.**

Standard access level control for services based on principally public data, standard username/password authentication and session control is used. However, if data modification services or private-owned, non public-domain datasets need to be implemented, web service security based on the OASIS 1.1 standard will be added.

In general, the following access levels are foreseen by the platform. Of these, levels 1, 3, and 4 are currently known to be needed for the SHARE portal (Table 4). These functionality-related access levels are managed on the portal level, by user-based allowing or disallowing portlet access.

Access level	User functionalities	User type
Level - 4	<ul style="list-style-type: none"> <li>Receives static information on the hazard model</li> <li>Access to Website</li> </ul>	Public/ Unregistered User
Level - 3	<ul style="list-style-type: none"> <li>Accesses specific static databases (e.g. single branch models, alternative logic trees etc.)</li> </ul>	Registered User/ SHARE Community Member
Level - 2	<ul style="list-style-type: none"> <li>Can launch back-end hazard calculations</li> <li>submit, edit or delete datasets</li> </ul>	Registered Expert User with specific training
Level - 1	<ul style="list-style-type: none"> <li>Has Administrator rights</li> <li>Configuration and write access beyond institutional IT policies</li> </ul>	System Administrator/ IT Team Member

**Table 4: Definition of access levels, user types and available functionalities.**

In addition, access levels overlap with data ownership and permissions; e.g. a level 2 user can access specific data only if he/she has reading permissions for that dataset, and a level 2 user can modify only datasets of which he/she is owner, or has been granted write access. Date-related permission control is implemented in the data access layer, i. e. server-side of the data provision services.

## 4 System Architecture

The SHARE Portal is a component of a distributed system that communicates internally and to the outside via Web Services. This system is divided into multiple tiers (Figure 1) and a detailed description of the system architecture is provided in Deliverable D6.3. The following is a short description necessary to understand the entire framework and the how the Portal component is integrated.

### **Database Tier:**

The database tier consists of three subsystem that manage large amounts of data. The sub-systems comprise data on Earthquake catalogs, seismic source zones and ground motion prediction equations. These data need to be stored, modified, backed-up, retrieved and archived. These requirements are best achieved using a Database Management System. Since the data are of special category/type (, the choice of available DBMS is reduced. The product “postgresql 8.3 (+ postgis extensions)” fits the requirements well and hence, has been chosen (see documentation on system Architecture).

### **Data Access Tier:**

The data used in earthquake modelling is available in many formats. A common data model has been developed in order to allow interoperability. The portal requests Web Services that deliver this data model. Therefore, the various data sources are converted to this common format.

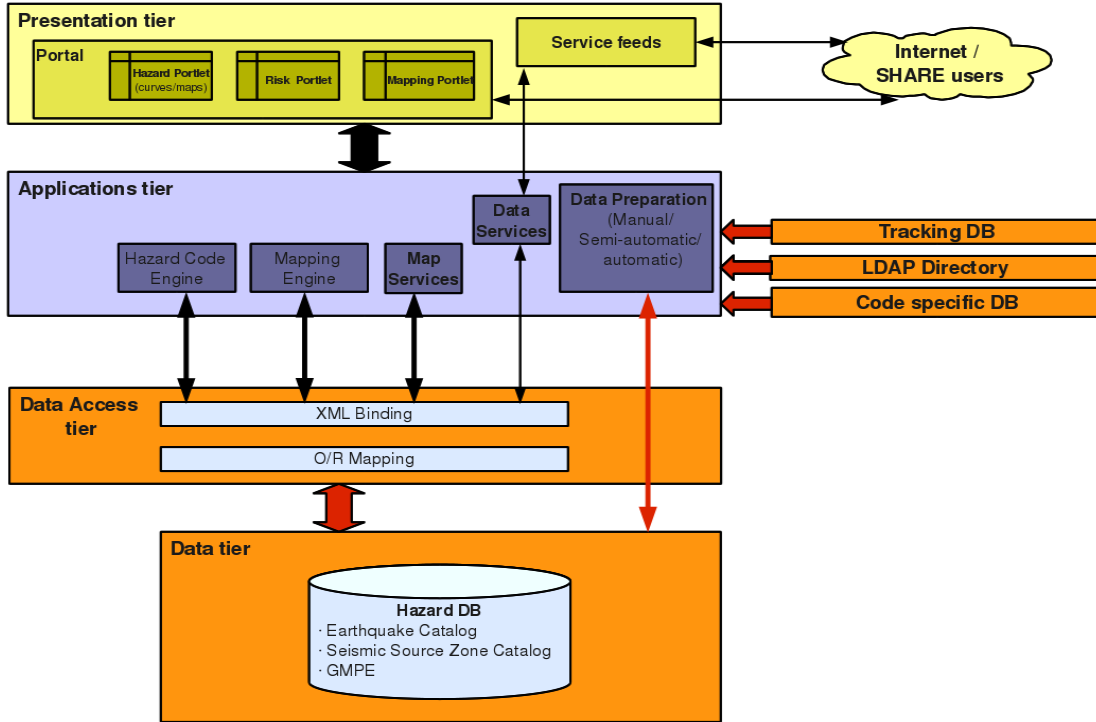
This new XML based format (named as shaML) is being proposed and created (see Deliverable D6.3). All available data needs to be converted to shaML. In this tier, the data flow into and out-of the database will be streamlined. Additionally, in this tier, the XML binding to Java Objects and subsequent ORM will take place.

### **Application Tier:**

The functional requirements are described as Usecases in Section “User-System Interaction”. The application tier contains the major functionalities/Usecases of the system, each functionality is mapped to one or many Web Services. These Web Services exchange data (in shaML format using Web Services) with the entry points (for XML binding) in the Data Access Tier.

**Presentation Tier (PORTAL):**

This tier is based on Portal framework (JSR 168 standards). The WebGUI is built using Portlet technology. Each Portlet is consuming one or more Web Services from the Application tier.



**Figure 1: Common openGEM / SHARE system and portal architecture. The Portal is represented by the Presentation tier that included all portlets and serves as the access point for end users.**

## 5 Policies

### Code namespaces:

SHARE is a key regional initiative of GEM. The projects use the same IT infrastructure - the openGEM framework of the GEM modelling facility – with active participation of the SHARE IT-specialists and scientists. Applications and extensions developed for purposes of SHARE feed back into the openGEM framework. To avoid technical barriers, SHARE code extensions are build directly into the openGEM codebase and code repository (currently under <https://svn.seismo.ethz.ch/opengem>), and they use the *org.opengem* namespace.

### Security and access levels

Access restrictions are implemented twofold: in form of access rights to functionality (i.e. portlets and calculation services), and in terms of data ownership/access rights to datasets.

For access to specific portlets, 4 access levels are defined:

Level - 4	<p>Receives static information</p> <p>Access to Website and services that display the SHARE standard (public) datasets</p>	<p>Public/ Unregistered User</p>
Level - 3	<ul style="list-style-type: none"> <li>• Accesses specific static databases (e.g. Single LT branch models, alternative models)</li> </ul>	<p>Registered User/ Community Member</p>
Level - 2	<ul style="list-style-type: none"> <li>• Can can launch ressource-demanding backend calculations</li> <li>• submit, edit, and delete self-owned datasets</li> </ul>	<p>Registered Expert User</p>
Level - 1	<ul style="list-style-type: none"> <li>• Has Admintrator rights</li> <li>• Configuration and write permission beyond institutional it policies (e.g. portal server configuration tools)</li> </ul>	<p>System Administrator/ IT Team Member</p>

*Table 5.1: Definition of access levels, user types and available functionalities.*

The portal logon application maintaines a DB of currently valid sessions.

### **Data access rights**

Data ownership and access patterns follow the same schema as filesystem user/group access rights under linux:

Each cumulative dataset (e.g. source catalogs, earthquake catalogs, hazard model, hazard calculation [as a representative of the according results] is stored along with user-id and group-id of its owner. Access management is portal based, e.g. a portlet must be provided with an interface for a data owner to set read and write access rights for himself, his group, and the public.

To maintain data ownership, credentials (user\_id, session\_id) are passed along with each request to the data access web services. The services resolve them based on the session database they share with the portal server, and take into account identity of the requester, and access rights to the requested datasets, when assembling the data response.

### **Capacity planning**

Capacity planning strongly depends on the size of the intended user groups with specific functionality access rights, and, for hazard calculation, the complexity (and thus computational demand) of the logic trees allowed hazard calculation triggered by the portal user (see "optional portlets"). As this information (and decisions on the implementation of optional elements) are not available, capacity planning is not possible at the time given.

### **Data retention and Archival**

In order to provide reliable linking capabilities of datasets, data write services must implement a policy that sets a dataset automatically to *read only* when published. The access status can be revised only by the administrator.

## **5.1 Presentation Tier: The PORTAL**

The project portal serves as the single access point to the project data and results. The portal serves static information on the project as well as dynamic and interactive access to data and results of the project. In technical terms, these various tasks are outlined as usecases that define the requirement for each of the single portlets. The following portlets will be implemented during the project:

1. Project Information: Static access to project information and activities
2. Hazard Map Portlet (HMP): Interactive access to pre-computed hazard maps
3. Hazard Curve Portlet (HCP): Interactive access to pre-computed hazard curves
4. Hazard Spectra Portlet (HSP): Interactive access to pre-computed hazard spectra
5. Hazard disaggregation Portlet (HDisP): Interactive access to data showing site-dependent hazard disaggregation results.
6. Data Viewer Portlet (DVP): Interactive access to data of the hazard model; examples are access to base-information on regional seismicity (faults, source zones, earthquake catalog(s)), a logic tree explorer.

In addition to the core portlets, we envision that the system shall be able to serve the following optional portlets. These are desirable extensions for a user-friendly single access point to all information, but may not be implemented due to time and man-month constraints:

1. Data submission portlet (DSP): Portlet to submit data from basic input data to entire hazard models in standard formats.
2. Networking Portlet (NP)
3. Hazard Computation Portlet (HcoP)
4. Portlets from other portals that provide additional useful information

This section defines the User-System interactions detailing each usecase. We provide screenshots of the portlets, describe the user choices and possible sequences of the interaction. Boxes with yellow background in all figures are intended to clarify the usage of the portlet.

The following detailed description of the portlets defines their functionality together with a snapshot of the GUI. The GUI may be subject to change for the purpose of a more user-friendly navigation when tools from the open-source community become available.

## **5.2 Usecase: Project Information**

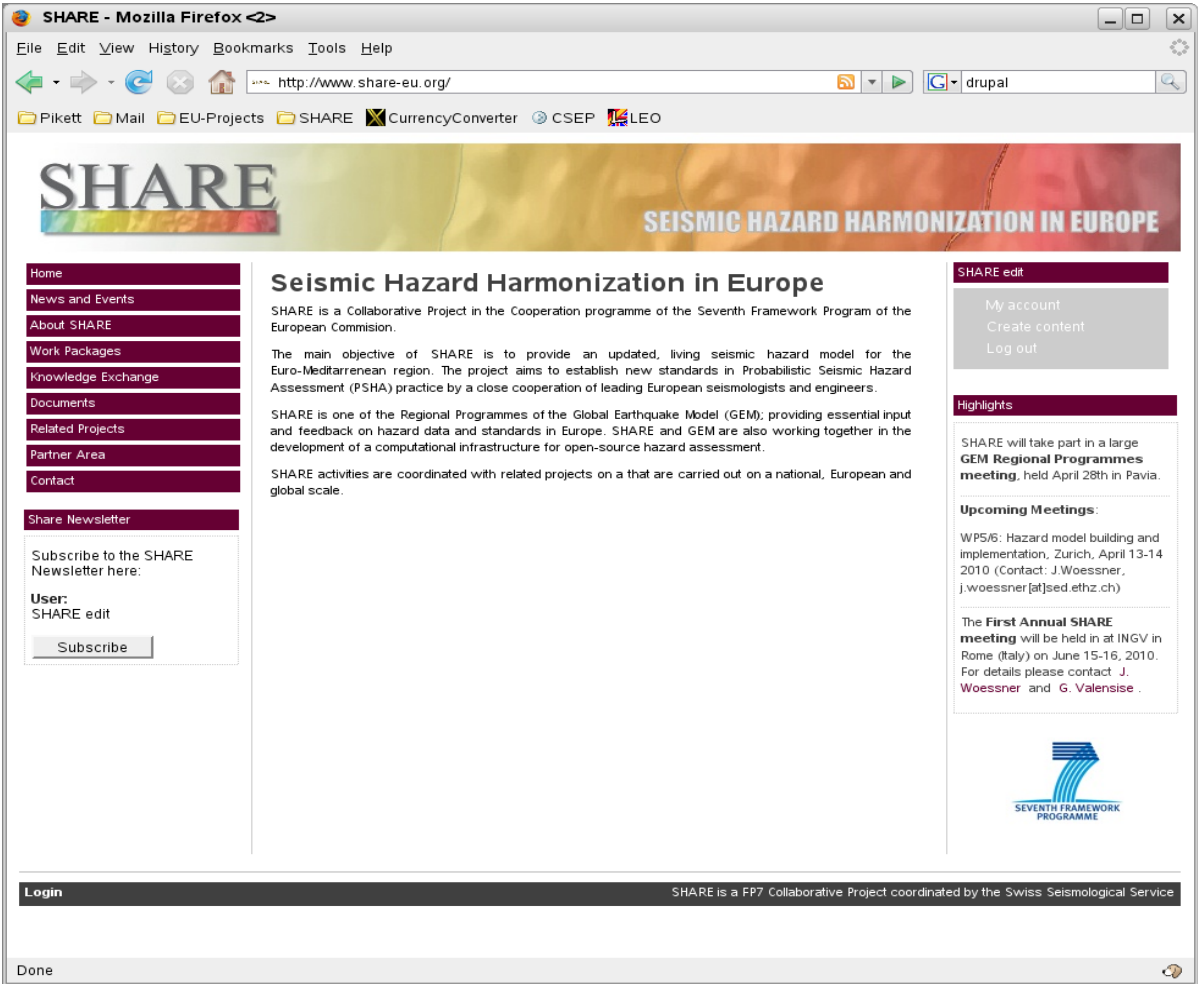
The Project Information is part of the SHARE web presence, however it is not mounted on the data portal itself. It is a website that provides information on the project and the activities during the project. The website accessible at [www.share-eu.org](http://www.share-eu.org) is and managed using Drupal cms ([www.drupal.org](http://www.drupal.org)),.

Drupal is a free and open source content management system (CMS) written in PHP and distributed under the GNU General Public License. It is used as a back-end system for many



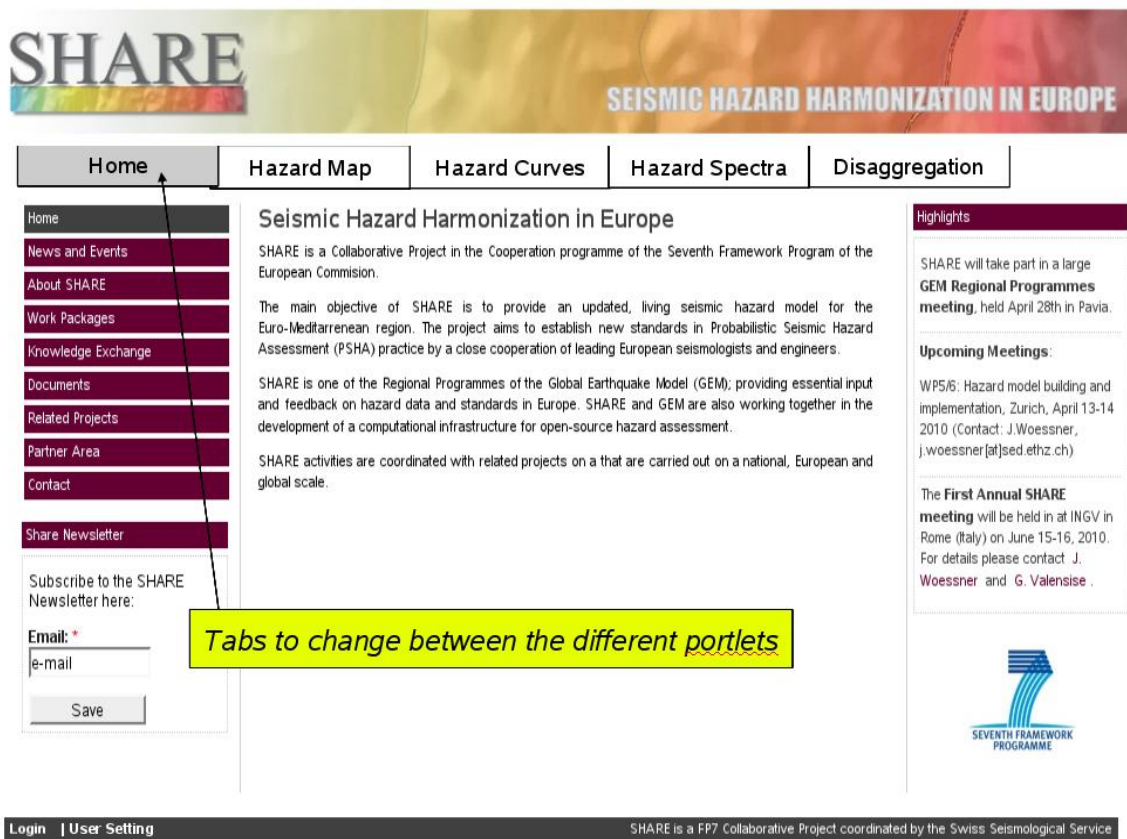
different types of websites, ranging from small personal blogs to large scientific, corporate and political sites, including for example cseptest.org, ubuntu.com, moby.com, nasa.gov and data.gov.uk. It is also used for knowledge management and business collaboration.

The standard release of Drupal, known as Drupal core, contains basic features common to most CMSs. These include the ability to register and maintain individual user accounts within a flexible and rich permission / privilege system, create and manage menus, RSS-feeds, customize page layout, perform logging, and administer the system. As installed, Drupal provides options to create a classic brochureware website, a single- or multi-user blog, an Internet forum, or a community website providing for user-generated content.



**Figure 2: SHARE web-site at www.share-eu.org. Web site is based on Drupal – CMS. The figure shows with the box to the upper right how to access and change the content. This box is not seen on the web for the general user.**

Drupal was also designed to allow new features and custom behavior to be added to extend Drupal's core capabilities. This is done via installation of plug-in modules (known as contrib



**Figure 3: Access to portal at [www.portal.share-eu.org](http://www.portal.share-eu.org). Default is to point the user to the static project information site (Tab: Home) from where the user then can access the data.**

modules) created and contributed to the project by open source community members. For this reason, Drupal is sometimes described as a content management framework. Drupal is also described as a web application framework, as it meets the generally accepted feature requirements for such frameworks. Although Drupal offers a sophisticated programming interface for developers, no programming skills are required for basic website installation and administration. The standalone web-application (Figure 2) provides updated information on the project.

The CMS is also integral part of the SHARE portal at <http://portal.share-gem.org>. There, it can be accessed via the HOME tab (Figure 3).

The gray bar at the bottom of the page has the functionalities to define specific User Setting. These are depending on the access rights of the user. These are defined in the Policies section.

### 5.3 Usecase: Hazard Map Portlet (HMP)

The HMP allows the user to access pre-computed result that display information on a particular hazard intensity measure type (IMT). The user's area of interest a region,

information on a particular site should be gained through the HCP. The user is interested in obtaining information about various relevant hazard results. The model selection procedure follows an internal logic which turns on / off available options in the more detailed selection process. The logic also implies that availability of data layers change; the user may only overlay data that was used to build the selected hazard model.

The user is presented with a pre-computed hazard map in the extent of the region showing the exceedance probability for a default IMT. The map extents over most 2/3 of the screen size (Figure 4) including **map controls** and an **overview map** that can be toggled on / off. A **layer control** allows to overlay data sets specific for the PSHA model. To the left of the map display, **Model Selection** in form of drop-down menus enable to choose various different parameter values. Below these, various **Export Utilities** are provided.

### **Map controls**

The user can choose via the **map controls** his region of interest. The map controls use the MapServer-Technology and allow to:

- zoom in and out
- grab the map and move
- move using arrows
- fall back to global map extent
- turn on/off overview map

The **overview map** shows the extent of the map on the pre-computed map extent. The map can be toggled on and off.

### **Layer control:**

In addition, different layers that display data used to compute the particular PSHA can be added. Examples of these data sets are:

- earthquake catalog
- Seismic source zonation
- earthquake activity rates
- b-values
- completeness levels
- prevailing type of faulting

- ground motion attenuation
- Maximum possible magnitude
- Maximum observed magnitude
- individual active faults
- composite seismogenic sources
- a regional overview of models implemented ground motion attenuation

### **Model selection**

The hazard model to be displayed can be chose through various controls by drop-down menus. The choices are dependent on each other:

1. **PSHA model:**

Select the PSHA model version. For example, choose between different iteration of the PSHA model for the European-Mediterranean region that were produced during the FP-7 SHARE project. Additionally, national PSHA models or pre-existing models such as the SESAME-model could be displayed. *Default: Latest calculation*

2. **Investigation interval:**

Select between different time periods, such as 50 years. *Default: 50 years*

3. **Probability of Exceedance:**

Select probability of exceedance for the investigation interval. *Default: 10%*

4. **Intensity measure type (IMT):**

Select IMT such as PGA [g], PGV [m/s], PGD [m], SA [g] at a particular frequency, EMS98 intensity and so on. *Default: PGA [g]*

5. **Site condition:**

Select between different soil condition if available. *Default: reference bedrock*

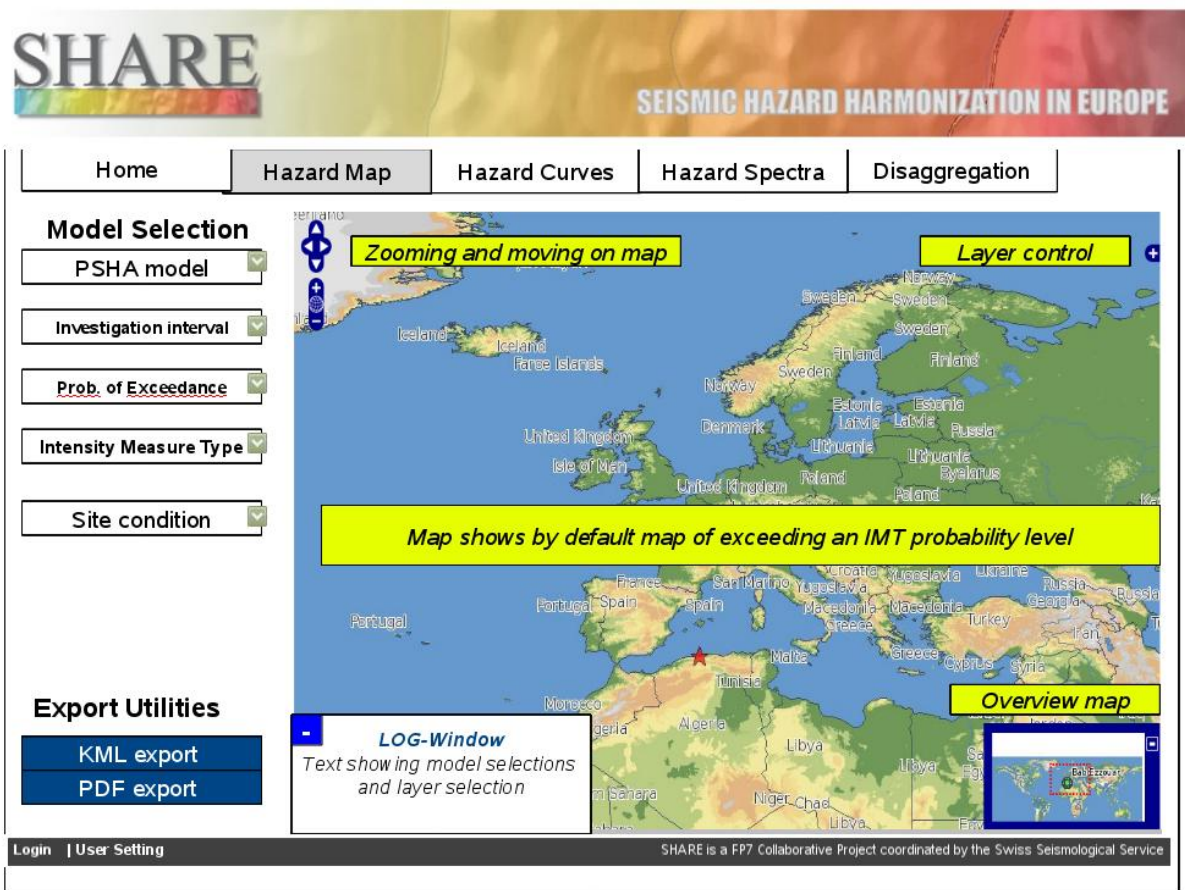
For a detailed specification on the access to single logic tree branches , details on the logic-tree definition are needed. This will be defined in future.

### **Export Utilities:**

The export utilities give the user the opportunity to save what has been selected. The window shall be able to be minimized and maximized. Two options shall be implemented:

1. **KML export:**

Export the selected model and data as shown in the map to KML that can be displayed



**Figure 4: Hazard map portlet.** The portlet allows to view hazard results for different models, earthquake rupture forecasts, source models, ground motion prediction equations.

on Google Earth. The KML data shall also enable to choose data to be displayed or not on Google Earth, so it shall contain a tree utility to select.

**2. PDF export:**

Generate a one A4 page summary pdf-file. The pdf-file shall contain the map displayed on the web-browser without the control buttons on it. The pdf shall also contain information on what is displayed, so the choices from the model selection and the layer selection shall be printed nicely on the pdf.

**3. Save data:**

Save the pure data that is displayed in a common format (maybe just ascii) including a header with the information from the LOG-Window.

**LOG-Window:**

The LOG-Window displays the model and layer selections by the user. The window shall be a dynamic, so similarly to the **Overview map** the user can toggle it to a size that the content can be read or to only view it only as a button.

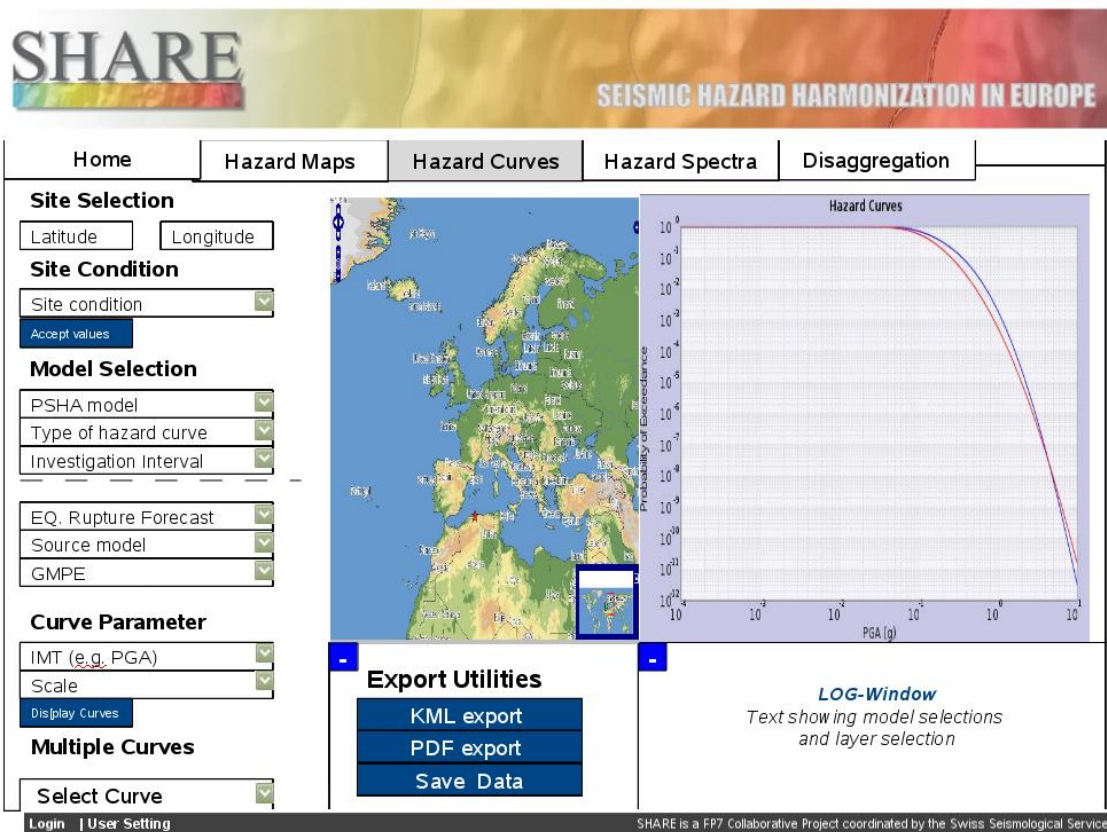


Figure 5: Hazard Curve Portlet

## 5.4 Usecase: Hazard Curve Portlet (HCP)

The user's area of interest is to obtain information about the seismic hazard at a particular site Figure 5. The portlet is designed in sections: In the left section, the user selects from multiple menus or provides input; the middle section shows an overview map such as shown in the HMP and orients about the site (indicated by some symbol); the right section shows the hazard curve or multiple curves. At the bottom of the page in the mid-section, **export utilities** shall be provided. In the right section, selected parameters are recorded and displayed in the **LOG-window**.

### Site selection / Site condition:

The site can either be selected from the map window that provides the usual options as defined for the HMP. Selecting a site on the map with the mouse will be displayed in the coordinate boxes. Additionally, the user can choose between different soil conditions if available (*Default: reference bedrock*)

The button “Accept values” freezes the selection and invokes the logic behind to lookup further available data for this site.

### **Model selection:**

This section provides multiple choices that depend on the pre-computed hazard results:

1. **PSHA Model:**

Select between different PSHA models if available for the site (see HMP)

2. **Type of hazard curve:**

Select between *Mean hazard curve*, *Mean hazard curve and fractiles* (one and two standard deviations if available), and *logic tree branch*. The latter is most complicated and implies more additional choices than the others. Default: *Mean hazard curve and fractiles(one standard deviation)*

3. **Investigation Interval:**

Select between different time periods (25y to 5000y). *Default: 50 years*

The next three choices are only needed for the choice *Logic tree branch* in **Type of hazard curve**:

1. **EQ Rupture Forecast**

2. **Source model**

3. **GMPE**

For a detailed specification on the access to single logic tree branches , details on the logic-tree definition are needed. This will be defined in future.

### **Curve Parameter:**

The user selects from different available IMT and also selects the scale:

1. **IMT:**

Select IMT such as PGA [g], PGV [m/s], PGD [m], SA [g] at a particular frequency, EMS98 intensity and so on. *Default: PGA [g]*

2. **Scale:**

The y-axis shows always a probability of exceedance between 0 and 1. The x-axis varies with the selected IMT. Select linear, logarithmic on both axes, semi-logarithmic (x-logarithmic).

### **Export Utilities:**

The export utilities give the user the opportunity to save what has been selected. The utility shall be able to minimize and maximize. Two options shall be implemented:

1. **KML export:**

Export the selected model and data as shown in the map to KML that can be displayed on Google Earth. The KML data shall also enable to choose data to be displayed or not on Google Earth, so it shall contain a tree utility to select.

2. **PDF export:**

Generate a one A4 page summary pdf-file. The pdf-file shall contain the map displayed on the web-browser without the control buttons on it. The pdf shall also contain information on what is displayed, so the choices from the model selection and the layer selection shall be printed nicely on the pdf.

3. **Save data:**

Save the pure data that is displayed in a common format (maybe just ascii) including a header with the information from the LOG-Window.

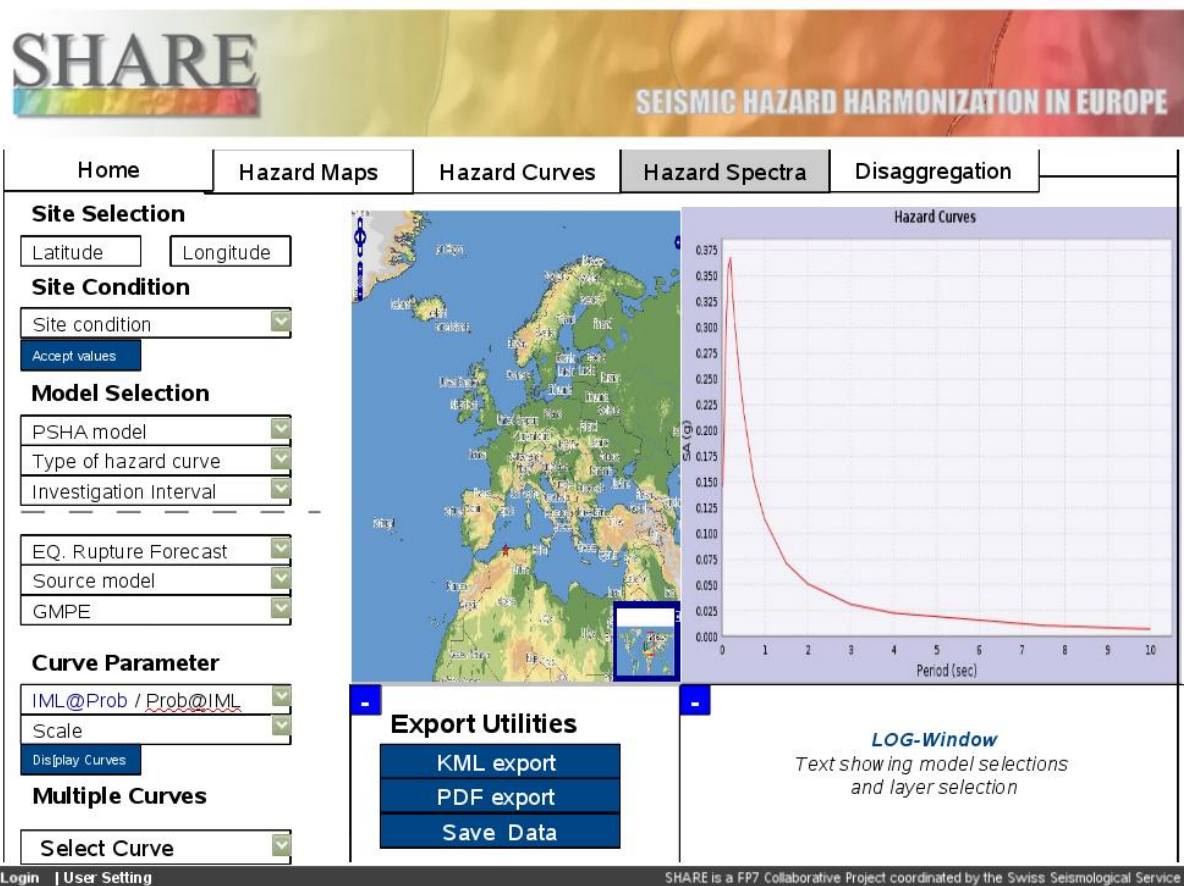
**LOG-Window:**

The LOG-Window displays the selections of the user. The window shall be dynamic, so similarly to the **Overview map** the user can toggle it to a size that the content can be read or to only view it only as a button.

## 5.5 Usecase: Hazard Spectra Portlet (HSP)

The user's area of interest is to obtain information about the seismic hazard at a particular site Figure 6. The portlet is designed in sections: In the left section, the user selects from multiple menus or provides input; the middle section shows an overview map such as shown in the HMP and orients about the site (indicated by some symbol); the right section shows the hazard spectra or multiple hazard spectra. At the bottom of the page in the mid-section, **export utilities** shall be provided. In the right section, selected parameters are recorded and displayed in the **LOG-window**.





**Figure 6: Hazard Spectra Portlet**

**Site selection / Site condition:**

The site can either be selected from the map window that provides the usual options as defined for the HMP. Selecting a site on the map with the mouse will be displayed in the coordinate boxes. Additionally, the user can choose between different soil conditions if available (*Default: reference bedrock*)

The button “Accept values” freezes the selection and invokes the logic behind to lookup further available data for this site.

**Model selection:**

This section provides multiple choices that depend on the pre-computed hazard results:

**1. PSHA Model:**

Select between different PSHA models if available for the site (see HMP)

**2. Type of hazard curve:**

Select between *Mean hazard curve*, *Mean hazard curve and fractiles* (one and two standard deviations if available), and *logic tree branch*. The latter is most

complicated and implies more additional choices than the others. Default: *Mean hazard curve and fractiles(one standard deviation)*

3. **Investigation Interval:**

Select between different time periods, such as 50 years. *Default: 50 years*

4. The next three choices are only needed for the choice *Logic tree branch in Type of hazard curve:*

5. **EQ Rupture Forecast:**

6. **Source model:**

7. **GMPE:**

8. For a detailed specification on the access to single logic tree branches, details on the logic-tree definition are needed. This will be defined in future.

**Curve Parameter:**

The user selects from different available measures and also selects the scale (*Period [s]*):

1. **Intensity-Measure Level (IML) as function of Probability of exceedance (P) or P as function of IML:**

Select between IML at a given Probability of exceedance (y-scale: *SA [g]*) or vice versa a probability level at a given intensity-measure level (y-scale: *Probability of exceedance*). *Default: P as function of IML*

2. **Scale:**

The y-axis shows always a probability of exceedance between 0 and 1. The x-axis stays at *Period [s]*. Select linear, logarithmic on both axes, semi-logarithmic (x-logarithmic).

**Export Utilities:**

The export utilities give the user the opportunity to save what has been selected. The utility shall be able to minimize and maximize. Two options shall be implemented:

1. **KML export:**

Export the selected model and data as shown in the map to KML that can be displayed on Google Earth. The KML data shall also enable to choose data to be displayed or not on Google Earth, so it shall contain a tree utility to select.

2. **PDF export:**

Generate a one A4 page summary pdf-file. The pdf-file shall contain the map displayed on the web-browser without the control buttons on it. The pdf shall also

contain information on what is displayed, so the choices from the model selection and the layer selection shall be printed nicely on the pdf.

### 3. **Save data:**

Save the pure data that is displayed in a common format (maybe just ascii) including a header with the information from the LOG-Window.

### **LOG-Window:**

The LOG-Window displays the selections of the user. The window shall be dynamic, so similarly to the **Overview map** the user can toggle it to a size that the content can be read or to only view it only as a button.

In the following, specifications for additional portlets are describe that extend the functionalities, but are not basic requirements. It is designed as a wish-list that is technically possible but yet not assumed to be implemented in full detail during the project.

### **5.6 Usecase: Disaggregation (HDisP)**

Details for the disaggregation portlet need to be specified.

### **5.7 Usecase: Data Viewer Porlet (DVP)**

The data viewer portlet will allow the users to access the input data for the hazard models, stored in the distributed databases. Access rights still need to be defined. Thus we implement this portlet at a later stage.

### **5.8 Optional Usecases**

The following usecases are optional but will be implemented in future as they provide essential functionalities for a sustainable portal.

#### **5.8.1 Usecase: Data Submission (DSP)**

The System should be capable of handling datasets, which are of

- Varying formats
- Different Size
- Belongs to various categories
- Inconsistent / Incomplete
- Needs to be reviewed by a Subject Matter Expert.

Hence, the data has to be prepared before being formally accepted into the system by loading into the database. One of the steps in this usecase is “Do Consistency/Reality checks”, which would be done after the conversion into a common system markup-based format (PSHAML). These steps should be “Automatic”, but, will initially be manual/semi-automatic.

This usecase has three sub usecases,

1. **SendDataToSystem** : Here a preliminary automatic “Consistency/Reality” checks are done.
2. **WritetoDatabase**: The Data is written into the Database, but is marked “Not Approved for Distribution”.
3. **ApprovalOfTheData**: A Subject Matter Expert looks manually through the data, a workflow is used for this purpose. Then the data is marked “Approved for Distribution” in the database.

The Illustration-6 shows how the entire “Data Submission” can be achieved using a workflow. One can also enforce other controls like “four eyes controls”.

### **5.8.2 Usecase: Request Data and Services (RDSP)**

The SHARE system is to be flexible to

- accept “codes” that implements different models or different methodologies (i.e., computing Hazard Curves)
- Provide User Management
- Consume and manage “data services agents”

Use of some of these features, may extend over the lifetime of system.

### **5.8.3 Usecase: System Administration**

The SHARE system is a repository of a large amount of information, generates a large amount of information. All these information have to be disseminated appropriately and as desired by the users of this system. A “System Manager” is a trained/IT personnel, who would, on a timely basis, perform the following:

- Manage the RSS feeds (collect/add/format/arrange the content in the feed).
- Manage the social networking application (remove redundant users, collect and process user feedbacks).
- Act as website manager (manage static content-format and review the presentation of the content).
- Provide “system health” status.

#### **5.8.4 Usecase: Networking**

All users can subscribe to the RSS feeds containing any updates to any part of the SHARE system e.g., updated catalogs, news items or a new service being available. These feeds will be made under different category – Hazard, Risk, IT and other news. As the community of users of this system and users interested in Hazard Assessment, Risk Estimation and related fields, grow, there will be a need for social networking. An “facebook” or “facebook-like” user is expected and there will be parts of the system/portal catering to this. All user are expecting to search within the *SHARE* System/Portal for information in the forms of documents, maps, etc.

#### **5.8.5 Usecase: Hazard Calculations**

This portlet will allow to define a model and start computations via a standard web-browser. The hazard input model needs to be fully specified within this portlet which requires a great amount of detailed choices and a pre-defined logic. This also involves capabilities on the IT-infrastructure that need to be solved.

## 6 Detailed Portal design

### 6.1 System design

A brief system design of the SHARE Portal is presented here. The major components are

- Database server (see system design document)
- JEE Application server, containing the Servlet container
- Enterprise Information Portal, containing the Portlet container
- LDAP server
- Map server (see system design document)
- Web Services - \* (Interoperability, Security) (see system design document)
- The Database server is running Postgresql 8.3 (with postgis extensions). The postgis extensions are essential for handling spatial information. The database server will be backed up on the ETH Zürich roboter, every evening. (see system design document)
- JBoss 5.1.x, an JEE application server running on a virtual machine is the share production instance. All the web applications (individually mapped to a usecase/functionality).
- Jetspeed 2.2.x, is an Enterprise Information Portal has an in-built Portlet container (Pluto 2.0, which is JSR-286 complaint). Each of these portlets contain the necessary GUI for data/user input and output.
- An LDAP server (openLDAP 2.4.x) will provide the required Access Control mechanism and forms a common user/resource directory.
- UMN MAPSERVER 5.4 is a widely used open source mapserver product. The *SHARE* mapserver will provide the maps on-demand. In addition, another open source product, (see system design document)

“OpenLayers 2.8” will be used to add interactivity to the SHARE hazard maps. Web Service protocols are to be used to achieve SOA. It is used to exchange data between: Portlets (Portal) ↔ Web-Application(Services), Web-Application (Services) ↔ entry points for XML-binding(Data Access ) and for Data Services an open source product (from Apache Software Foundation) “Axis2 1.5” is to be used for WS-I and WS-Security protocols.

## **6.2 Portal design**

The Portal framework used is “Jetspeed 2.x” and the portlet container is “Pluto 2.x”. . The data transfer format used are as follows:

- XML (& its variants) are the data transfer technologies used
- Web Services (using SOAP, WSDL,...) would be used as transfer mechanism
- KML format will be used for the visualization of 3D geospatial data in programs like Google Earth, Worldwind (NASA)
- GML (the OGC Geography Markup Language) is an XML grammar for expressing geographical features. It is delivered by WMS and WFS services.

There are “Portlet Producers” and “Portlet Consumers”. The Portlet Producers are organizations which take-in data from existing databases/repositories and implement a certain functionality/service using portlet technologies. The Portlet Consumer is the SHARE Portal, which uses the functionalities to supplement its services. This is a value addition to some special clients/users, who would like their services to be hosted on the SHARE portal. This also provides a mechanism to “outsource” the development of certain portlet development and consume portlets from other resources such as [www.seismicportal.eu](http://www.seismicportal.eu).

The SHARE Portal will not consume data directly from external software agents (for e.g., as a data web service). All data entering the SHARE system has to undergo an Inconsistency/Reality check (a service not available as a portlet).

## **6.3 Corporate Identity**

This refers to the look-n-feel of the Portal. There are two aspects to this – Graphical and non-Graphical. Graphical aspect refers to the colours, corporate logos and patterns. Non-graphical aspects are choice of portlets, placement of portlet(s) on the various areas of the Portal and the portlets themselves.

Graphical aspects are combined into a template, more precisely a Velocity template. There will be a “SHARE template”, however, user can customize the Portal using the “available” templates. Templates are created using html, CSS and AJAX scripts

Non-graphical aspect is achieved using concept of portlet layouts. This aspect could be “locked/setup” by the system designer based on the user profiles.