

Deliverable

D8.8 European Rapid Loss Assessment Operational - Demonstrator

Deliverable information	
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Summary

D8.8 is a demonstrator deliverable of a European (earthquake) Rapid Loss Assessment Service which combines the efforts of the three EPOS Seismology pillars: ORFEUS, EMSC, EFEHR. This service is not currently running publicly, but the tools and models for this service have been openly released at https://gitlab.seismo.ethz.ch/hcrowley/rapid_loss_eu and can be readily adopted by responsible agencies, for example to set up a national RLA system. More details on the technical aspects of this service are provided in RISE Deliverable D6.5. As described therein, the service makes use of the European Seismic Risk Model (ESRM20) (Crowley et al., 2021).

1. European ReLA Code ReadMe

The readme of the open source European Rapid (earthquake) Loss Assessment Code (https://gitlab.seismo.ethz.ch/hcrowley/rapid_loss_eu, see screenshot below) is provided in the following pages.

The screenshot shows the GitLab repository page for 'European Rapid earthquake Loss Assessment Code' by Helen Crowley. The repository is located at https://gitlab.seismo.ethz.ch/hcrowley/rapid_loss_eu. The page displays the repository name, project ID (342), and statistics: 22 Commits, 1 Branch, 0 Tags, and 1.6 MB Project Storage. A recent commit titled 'change min MMI to 3' by Helen Crowley is shown, authored 1 week ago. The repository is currently on the 'main' branch, and the current file path is 'rapid_loss_eu /'. The page includes options to 'Find file', 'Web IDE', and 'Clone'. Below the commit information, there are several utility buttons: 'README', 'GNU AGPLv3', 'Add CHANGELOG', 'Add CONTRIBUTING', 'Enable Auto DevOps', 'Add Kubernetes cluster', 'Set up CI/CD', and 'Configure Integrations'. A table lists the repository files and their last commit details:

Name	Last commit	Last update
ReLA	change min MMI to 3	1 week ago
shapefile	fix typos	4 weeks ago
templates	update to produce median losses and ale...	3 weeks ago
.gitignore	update to produce median losses and ale...	3 weeks ago
LICENSE	first commit of European ReLA software	1 month ago
README.md	Update README.md	4 weeks ago

These instructions explain how to set up the service, and run it for any ShakeMap (based on unique ID) in the European ShakeMap Service (<http://shakemap.eu.ingv.it/>). The triggering of this service following a specific event is not yet implemented, but can be easily integrated by users of the open source code.

2. References

Crowley H., Dabbeek J., Despotaki V., Rodrigues D., Martins L., Silva V., Romão, X., Pereira N., Weatherill G. and Danciu L. (2021) European Seismic Risk Model (ESRM20), EFEHR Technical Report 002, V1.0.1, 84 pp, <https://doi.org/10.7414/EUC-EFEHR-TR002-ESRM20>

https://gitlab.seismo.ethz.ch/hcrowley/rapid_loss_eu

Overview

The purpose of this code is to allow users to set up a Rapid earthquake Loss Assessment (ReLA) service that can be used in any country in Europe. The software reads a user-defined ShakeMap from the [European ShakeMap service](#), launches the OpenQuake engine to run loss and damage calculations, downloads and stores results and plots locally.

Installation

First download or clone this repository.

Install the OpenQuake engine (v3.15) using the instructions [here](#).

Activate the OpenQuake virtual environment (as described in the instructions above), then navigate to the main working directory of this repository and install all dependencies using `pip`, by running the following command:

```
pip install -r requirements.txt
```

The dependencies are as follows:

- `geopandas`
- `pyogrio`
- `pygeos`
- `lxml`
- `bs4`

Getting started

The software uses models from the `esrm20` repository, available [here](#). The software will expect to find a folder called `esrm20` in the same directory as this repository with the following structure:

- `Exposure_30arcsec`: Directory into which you should copy the exposure `.csv` files from the `esrm20 Exposure_30arcsec` repository, for all the countries of interest.
- `Vulnerability`: Directory into which you should copy all of the `xml` files from the `esrm20 Vulnerability` repository with 'ShakeMap' in the name, as well as the 'esrm20_exposure_vulnerability_mapping.csv' file.

From the command line (terminal) navigate to the ReLA folder and run the software with:

```
python main.py
```

You will be prompted to input the event id of a ShakeMap. Any event id from the [European ShakeMap archive](#) can be input.

Once the analyses have completed you will find three new folders on the repository:

- `inputs`: this includes a directory with the name of the ShakeMap unique ID, inside which you will find the downloaded ShakeMap grid and uncertainty files, a reduced ShakeMap (with intensity values greater than or equal to III), the 30 arc second exposure models that have been cut to the size of the reduced ShakeMap, as well as the log files of the OpenQuake engine calculations (all of these are useful for results checking and debugging).
- `outputs`: this includes a directory with the name of the ShakeMap unique ID, inside which you will find a summary of the mean losses/damage as well as loss/damage distribution plots.
- `outputs_oq`: this includes a directory with the name of the ShakeMap unique ID, inside which you will find all of the OpenQuake engine outputs for the calculation (this provides access to additional outputs, and can be used for further checking and debugging).

Acknowledgements

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If your software can interact with users remotely through a computer network, you should also make sure that it provides a way for users to get its source. For example, if your program is a web application, its interface could display a "Source" link that leads users to an archive of the code. There are many ways you could offer source, and different solutions will be better for different programs; see section 13 for the specific requirements.

See the [LICENSE](#) for the full license text.