



Project funded by
EUROPEAN UNION



Rapid Earthquake Damage Assessment Consortium REDACT

• A Black Sea Basin Joint Operational Programme 2014-20 project

WP.T1 Deliverables. July - March 2021

Common borders. Common solutions.

WP.T1 A harmonized approach for Rapid Earthquake Damage Assessment Deliverables:

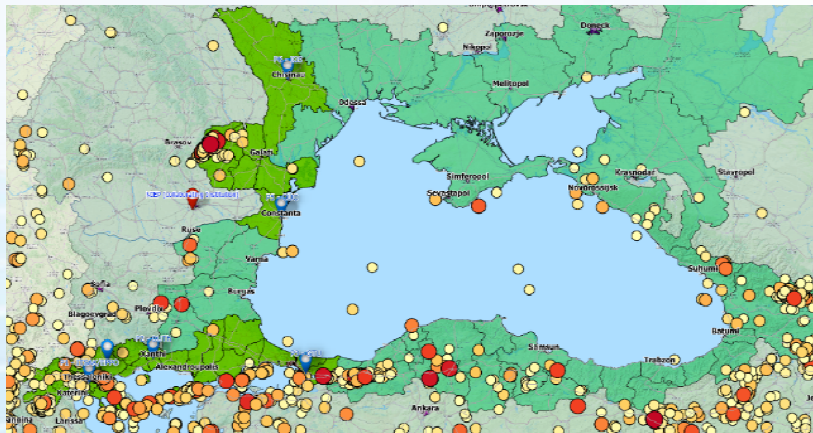
1. D.T1.1.1: **Evaluation of REDA Capabilities in each partner country** (230 pages, 134 relevant figures, 46 relevant tables, 240 references)
2. D.T1.2.1: **Available methodologies for REDA** (128 pages, 34 relevant figures, 20 relevant tables, 203 references)
3. D.T1.3.1: **System specifications for a harmonized REDA** (17 pages)
4. D.T1.4.1: **REDA system operational requirements** (31 pages)

WP T1 A harmonized approach for Rapid Earthquake Damage Assessment		26		Responsible: OUC													
A.T1.1	REDA: Current status assessment in partners' countries	1/7/2020	31/12/2020	6	D.T1.1.1 Evaluation of REDA Capabilities in each partner country	D.T1.1.1. Month N6											
A.T1.2	Feasibility study of available methodologies for REDA	1/7/2020	31/12/2020	6	D.T1.2.1 Available methodologies for REDA	D.T1.2.1. N6											
A.T1.3	System specifications for a harmonized REDA	1/7/2020	31/1/2021	7	D.T1.3.1 System specifications for a harmonized REDA	D.T1.3.1. N7											
A.T1.4	REDA system operational requirements	1/7/2020	31/1/2021	7	D.T1.4.1 REDA system operational requirements	D.T1.4.1. N7											

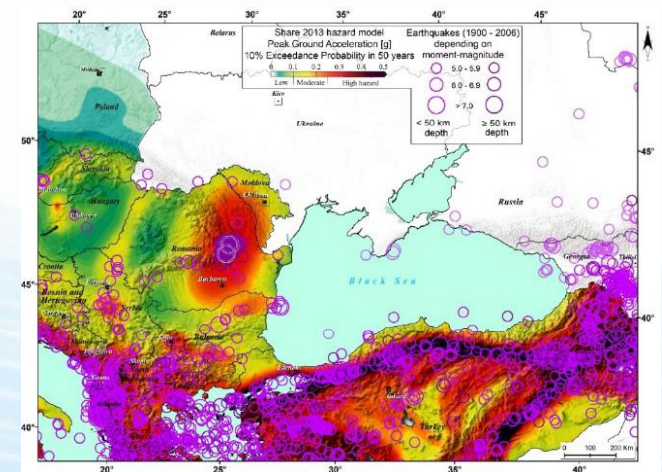
Common borders. Common solutions.

The first deliverable helped develop the **harmonized knowledge basis** upon which to base decisions regarding the REDA system **operational requirements and harmonized outputs**. Subjects covered include the:

- current status of earthquake monitoring and research in REDACT partner countries.
- Current Research conducted (including important projects) in the area.
- Evolution of seismic design codes, current status and trends.
- Availability of exposure and vulnerability data.
- Educational initiatives for risk reduction.



Black Sea Programme Area (green), the REDACT project implementation area (highlighted), project partner locations (blue pins) and earthquakes with a Magnitude $M \geq 4.5$



Map of earthquakes with magnitude $M \geq 5$ in the Black Sea Area and the SHARE Project hazard map for some of the countries (Giardini et al., 2013)

Common borders. Common solutions.

A SWOT analysis indicated that:

Seismic hazard

is being systematically analyzed in all of the REDACT Project partner countries however, **different approaches as well as input seismic sources and GMPEs adopted for seismic hazard assessment, often lead to different, even partially conflicting, maps of seismic hazard in the Cross Border Areas. Knowledge of site effects specifically for target project areas is partially available.**

GMPEs

In all of the project partner countries, **recently published ground motion models** have been determined and can be used to provide relevant hazard input for earthquake damage estimations and for further improved harmonized approaches.

Seismic networks

consisting of new generation accelerometers, **operate in all the REDACT Project partner countries. Real-Time data exchange is established over ORFEUS EIDA nodes and also over direct data-exchange agreements.**

Geotechnical hazards (soil liquefaction, landslides)

are **well documented especially in areas where they were reported and identified as a critical problem – such as Greece, Bulgaria and Turkey.** In Romania and Moldova there is still a need for a better understanding and quantification of these hazards.

Exposure and vulnerability

The level of details in terms of exposure datasets is different between countries. Vulnerability assessment methods also differ, accounting for both the characteristics of the building stock in each country and its differences in seismic design, but also in the methodological approaches adopted; even though in some cases **projects such as RISK-UE or SERA brought regional researchers under the same effort.** However, this overview of the available input data and REDA systems for each country depicts a **promising potential for future harmonization of loss and damage estimations.**

Common borders. Common solutions.

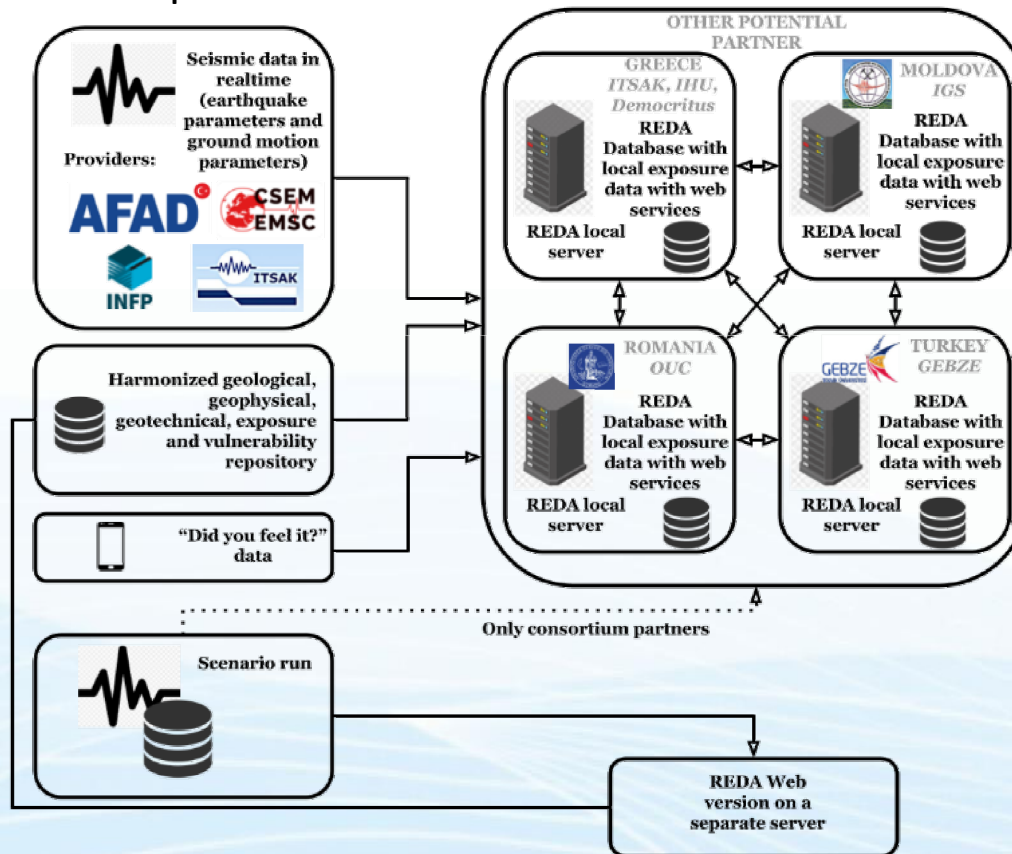


This deliverable also includes:

- An overview of existing rapid loss estimation methodologies.
- An overview of available software (AFAD-RED, CAPRA software collection, ELER, HAZUS, MAEVIZ, OPENQUAKE, PAGER, SELINA, others).
- Expected capabilities of the REDA platform:
 - **Ability to integrate multiple loss estimation methodologies - empirical and analytical;**
 - Capability of receiving and using either **near real-time** output from seismic network systems in partner countries or **critical parameters of the time histories** (e.g., PGA, PGV, Spectral Acceleration etc.) as well as input parameters from other European or world-wide seismic institutions such as EMSC-CSEM or USGS or initiatives such as ORFEUS EIDA (e.g., real-time earthquake source parameters);
 - **Ability to produce rapid results** (in less than 30 minutes after a moderate or large magnitude earthquake in the Black Sea Area), primarily in terms of estimated **percentage of damaged buildings and fatalities; allow for a re-run of the scenario**, with updated data but also, for example, with ShakeMaps from other institutions;
 - **capable of presenting results at different scales;**
 - Ability to quantify/calculate and provide **uncertainty of the estimated** results.

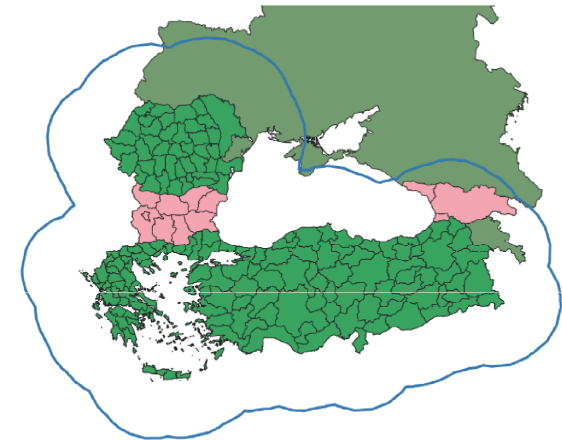
Common borders. Common solutions.

REDA implementation scheme



Six (6) fully operational systems having the same functionality, sharing the same data EXCEPT the building inventories due to "sensitive" data sharing restrictions.

First proposal for the REDA triggering area

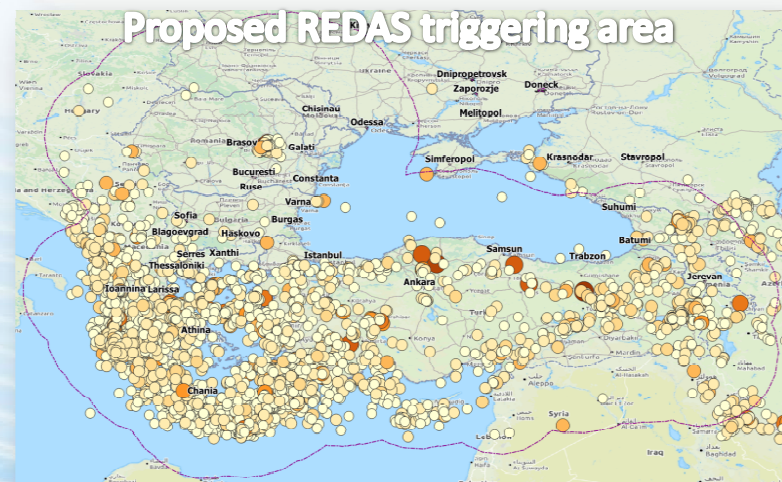
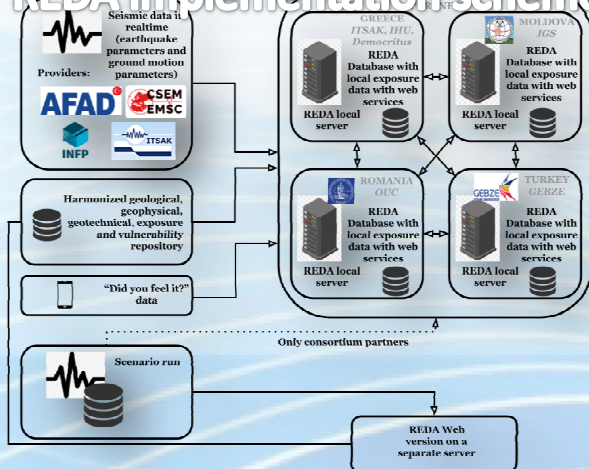


Major challenge: multiple input data source and formats and **data policy restrictions**, lead to the **necessity for decentralized systems** for real-time processing. Still, **harmonization** is reflected in many levels and the capability of covering Cross Border Areas, exists.

Common borders. Common solutions.

- Six (6) **fully operational REDA Systems (REDAS)** having the same functionality, sharing the same data **EXCEPT the building inventories** (due to “sensitive” data sharing restrictions).
- Each REDA System will provide solutions both on scenario based cases and on near Real-Time by **using data from ALL monitoring stations** (so the strong ground motion parameters will be calculated by each REDAS in near Real-Time).
- At the same time, due to building inventory sharing restrictions, each REDAS will have access to the respective National inventory data so, it will be able to calculate damage and losses only within country borders.
- **All input data and outputs provided by REDAS will be fully harmonized** so outputs on both sides of the country borders, will be compatible to each other (for Cross Border Area coverage).

REDA implementation scheme



Common borders. Common solutions.



Project funded by
EUROPEAN UNION

REDACT
Rapid Earthquake Damage Assessment Consortium



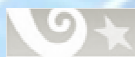
Rapid Earthquake Damage

Assessment Consortium **Thank You!** REDACT

- A Black Sea Basin Joint Operational Programme 2014-20 project

WP.T1 Deliverables. July - March 2021

Common borders. Common solutions.



CROSS BORDER
COOPERATION

