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EUCENTRE European Centre for Training and Research in Earthquake Engineering

IUSS Scuola Universitaria Superiore Pavia

# Support Action for Strengthening PAlestine capabilities for seismic Risk Mitigation

# SASPARM 2.0

## 2014 PROJECT FOR CIVIL PROTECTION FINANCIAL INSTRUMENT PREPAREDNESS AND PREVENTION SCHEME

## PROJECT OVERVIEW

**Pavia – Nablus**
**May 25, 2016**

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The project was presented in the **DG ECHO scheme**

European Commission

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# DG Humanitarian Aid and Civil Protection - ECHO

| ECHO A<br>Strategy, Policy, International Cooperation | ECHO B<br>Humanitarian Aid and Civil Protection Operations | ECHO C<br>Resources, Partnerships and Operational Support |
|---|---|---|
| A1 Strategy, Coordination and Inter-institutional Relations | B1 Emergency Response | C1 Human resources, Security, Document Management |
| A2 Information and Communication | B2 Central Africa, Sudan, Chad | C2 Budget, Audit, Informatics |
| A3 Policy and Implementation, Frameworks | B3 East, West and Southern Africa, Indian Ocean | C3 Finance, Legal Affairs, Partner support |
| A4 Specific Thematic Policies | B4 European Neighbourhood, Middle East, Central and SW Asia | C4 Field network, Transport and Logistics |
| *A5 Civil Protection Policy, Prevention, Preparedness and Disaster Risk Reduction* | B5 Asia, Latin America, Caribbean, Pacific | |

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EUROPEAN COMMISSION
DIRECTORATE-GENERAL HUMANITARIAN AID AND CIVIL PROTECTION - ECHO

ECHO A - Strategy, Policy and International Co-operation
**A.5 - Civil Protection Policy**

## PROJECT ATTRIBUTION

**Preparedness & Prevention 2014 Call**

| | Grant Agreement No. | Applicant organisation/ Title of the Project | Country | Responsible Desk Officer 1 | Responsible Desk Officer 2 |
|---|---|---|---|---|---|
| | **PREPAREDNESS PROJECTS** | | | | |
| 1. | SI2.693261 | University of Crete<br>**EVANDE**<br>Enhancing volunteer awareness and education against natural disasters through e-learning | GR | **Cristina Brailescu**<br>email: cristina.brailescu@ec.europa.eu<br>Tel.: +32 2 29 95 380 | **Ioanna Sgourdopoulou-Karra**<br>email : ioanna.sgourdopoulou-karra@ec.europa.eu<br>Tel.: +32 2 29 95617 |
| 2. | SI2.693276 | Sea Alarm Foundation<br>**EUROWA MODULE**<br>European module for oiled wildlife emergency response assistance | BE | **Ioanna Sgourdopoulou-Karra**<br>**email :** ioanna.sgourdopoulou-karra@ec.europa.eu<br>Tel.: +32 2 29 95617 | **Asta Mackeviciute**<br>email: asta.mackeviciute@ec.europa.eu<br>Tel.: +32 2 29 52899 |
| 3. | SI2.694378 | Emergency Services College<br>**EU-NU Coop**<br>EU-NU Cooperation project on strengthening EU's Nordic USAR modules | FI | **Per Øyvind SEMB**<br>email: per-oyvind.semb@ec.europa.eu<br>Tel.: +32 2 29 63942 | **Biljana ZUBER**<br>**email:** Biljana.ZUBER@ec.europa.eu<br>**Tel: +32 229-91804** |
| 4. | SI2.693705 | RBINS<br>**HNS-MS**<br>Improving preparedness to face HNS pollution | BE | **Ioanna Sgourdopoulou-Karra**<br>**email :** ioanna.sgourdopoulou-karra@ec.europa.eu | **Asta Mackeviciute**<br>**email:** asta.mackeviciute@ec.europa.eu<br>**Tel.: +32 2 29 52899** |

## PREVENTION PROJECTS

| | Grant Agreement No. | Applicant organisation/ Title of the Project | Country | Responsible Desk Officer 1 | Responsible Desk Officer 2 |
|---|---|---|---|---|---|
| 19. | SI2.693890 | MoI FIRE AND RESCUE<br>**From GAPS to CAPS**<br>Risk management capability based on gaps identification in the BSR | LT | **Biljana ZUBER**<br>**email:** Biljana.ZUBER@ec.europa.eu<br>Tel: +32 229-91804 | **Asta Mackeviciute**<br>**email:** asta.mackeviciute@ec.europa.eu<br>Tel.: +32 2 29 52899 |
| 20. | SI2.693711 | SIGMA<br>**ECOSHAZ**<br>Economics of prevention measures addressing coastal hazards | GR | **Ioanna Sgourdopoulou-Karra**<br>**email :** ioanna.sgourdopoulou-karra@ec.europa.eu<br>Tel.: +32 2 29 95617 | **Biljana ZUBER**<br>**email:** Biljana.ZUBER@ec.europa.eu<br>Tel: +32 229-91804 |
| 21. | SI2.696863 | SAMARITAN INTERNATIONAL<br>**ADAPT**<br>Awareness of Disaster Prevention for vulnerable groups+ | Int'l | **Patricia Sidarous**<br>**email:** Patricia.SIDAROUS@ec.europa.eu<br>Tel.: +32 229-86782 | **Biljana ZUBER**<br>**email:** Biljana.ZUBER@ec.europa.eu<br>Tel: +32 229-91804 |
| 22. | SI2.693249 | Villa Montesca<br>**CP MODEL**<br>Civil protection massive open developed e-learning | IT | **Biljana ZUBER**<br>**email:** Biljana.ZUBER@ec.europa.eu<br>Tel: +32 229-91804 | **Ioanna Sgourdopoulou-Karra**<br>email : ioanna.sgourdopoulou-karra@ec.europa.eu<br>Tel.: +32 2 29 95617 |
| 23. | SI2.694399<br>(External) | EUCENTRE (external)<br>**SASPARM 2.0**<br>Support action for strengthening PAlestine capabilities for seismic Risk Mitigation | IT | **Elisabetta BELLOCCHI**<br>Email: elisabetta.bellocchi@ec.europa.eu<br>Tel.: +32/2/29 98737 | **Roberto SCHILIRO**<br>Email: Roberto.SCHILIRO@ec.europa.eu<br>Tel.: +32 229-53433 |

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The project was presented in the **DG ECHO scheme**

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It continues the cooperation with Europe's neighbours in the context of the European Research Area, started by SASPARM, an FP7 Project.

**Duration** in months: 24

**Starting date**: January 01, 2015

## Consortium:

✓ **Eucentre (Coordinator)**: promotes and supports research and education in the field of seismology, geology, geotechnical engineering, hazard and risk assessment, flooding vulnerability assessment, ecological approach and emergency management, Re-insurance market;

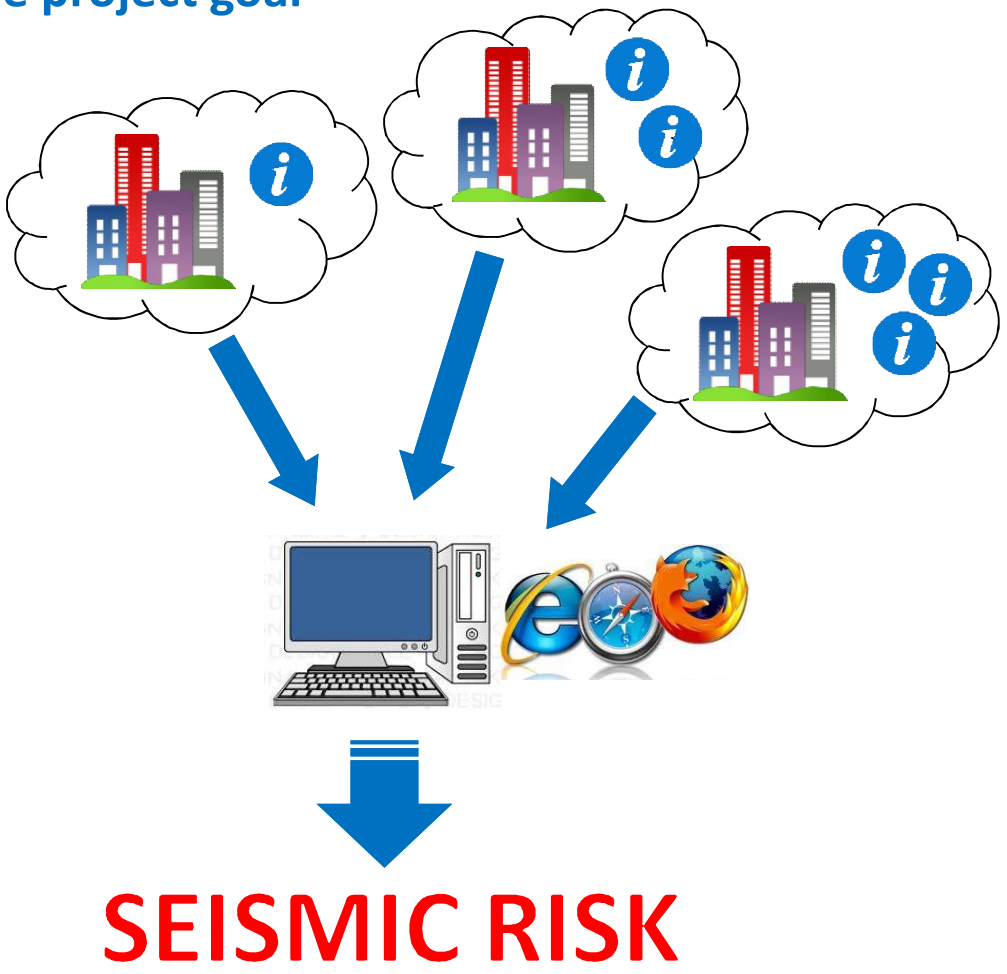
✓ **IUSS-Pavia**: offers advanced international undergraduate and graduate programs through:

- Undergraduate Internal courses open, on a merit base, to the most promising students of University of Pavia;
- Level II University Master degrees, fully taught in English providing a strong International approach;
- PhD Degrees providing an interdisciplinary point of view and exposure to cutting edge research;

✓ **An-Najah National University**: was originally established as An-Najah Nabuls School in 1918 in the Palestinian city of Nablus. In 1977 it became a full-fledged university and it is now the largest university in Palestine. The Earth Sciences and Seismic Engineering Center (ESSEC) at NNU was established in October 1996 in the city of Nablus. It is the only specialized center in earthquake engineering in the West Bank or Gaza Strip.

## The project goal

The project goal is to create a web portal where different users (**students/citizens/practitioners**/GO and NGO **stakeholders**) will be able to input and manage all the data on buildings, with increasing level of detail, and obtain all the information about the corresponding seismic risk.

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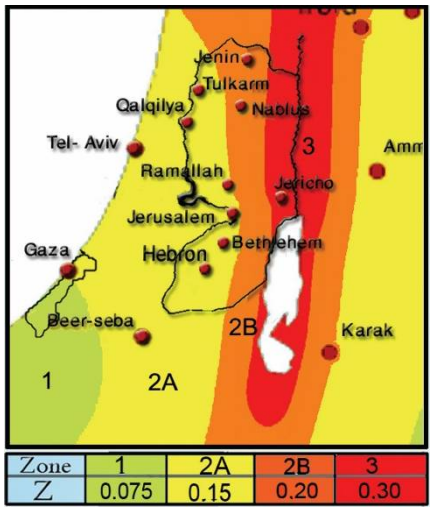
## Hazard




| Zone | 1 | 2A | 2B | 3 |
|---|---|---|---|---|
| Z | 0.075 | 0.15 | 0.20 | 0.30 |

## Vulnerability

## Exposure

# SEISMIC RISK

evaluation of the total losses caused by earthquakes that will be of interest in a given temporal period in a specific area

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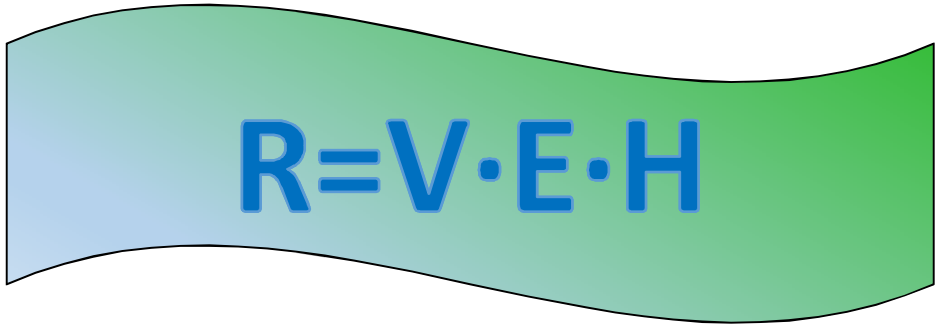
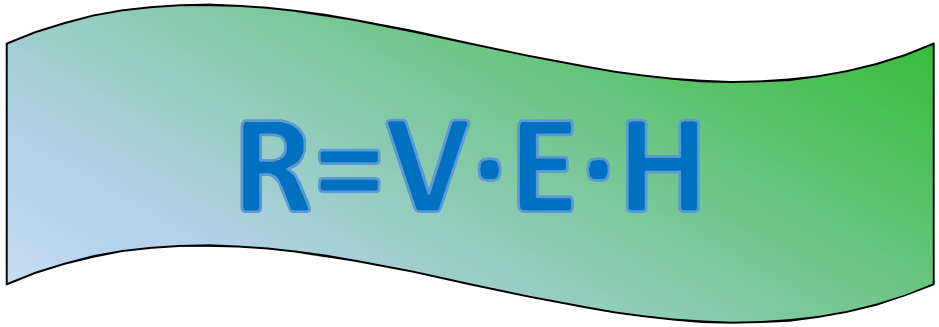



**R** = **Risk**

**V** = **Vulnerability**: attitude of property present in a structure to undergo a certain level of damage as a result of a certain level of shaking

**E** = **Exposure**: distribution of the population and civil activities in seismic areas; it depends on the historical evolution of the settlements

**H** = **Hazard**: probability of exceeding a fixed level of shaking in a site, in a specific time period




- Hazard is a physical characteristic of the territory
- The risk depends also on “human” variables : urbanization, number and value of the buildings, the presence of industries, etc.

**You cannot modify the Hazard, but you can mitigate the risk by acting on the Vulnerability**

## Project main targets

- ✓ The increase of risk perception by citizens and the development of the citizens' science
- ✓ The capacity building of local practitioners and building contractors
- ✓ The engagement of local stakeholders and policy makers leading them to establish prevention plans in the development of urban resilience strategies

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## Project expected results

- ✓ An increased awareness of seismic risk by the actors involved in the project: citizens, students, practitioners, GO and NGO stakeholders
- ✓ A shared database including a large number of vulnerability data
- ✓ A Web-Based Platform that integrates the data above and treats them through vulnerability models developed for the Palestinian building typologies, to evaluate seismic risk
- ✓ Guidelines on the implementation of measures to reduce vulnerability and, hence, mitigate seismic risk
- ✓ Guidelines for risk management policy aimed at mitigating the impact of socio-economic losses

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## The project is made of 8 different tasks:

- **TASK A**: organization of all the activities and management of the project;
- **TASK B**: collection of structural data by citizens and practitioners in forms. Two collection forms are planned, one for citizens and one for practitioners with differences in level of detail. The collected data will be used to implement the vulnerability models that will be used in the Web-Based Platform to evaluate seismic risk; measures
- **TASK C**: prevention and mitigation of seismic vulnerability through retrofit identified using the data collected in task B;
- **TASK D**: training courses for students, practitioners and citizens on the compilation of the forms and the use of the collected data;

## The project is made of 8 different tasks:

- **TASK E**: critical evaluation of existing tools and guidelines to quantify and reduce seismic risk in Palestine;
- **TASK F**: development and implementation of vulnerability models for the evaluation of seismic risk using the data collected in the task B;
- **TASK G**: development of the Web-Based Platform which has to integrate all the tools for performing seismic risk analysis;
- **TASK H**: identification and organization of publicity and the diffusion of the project activities and results.

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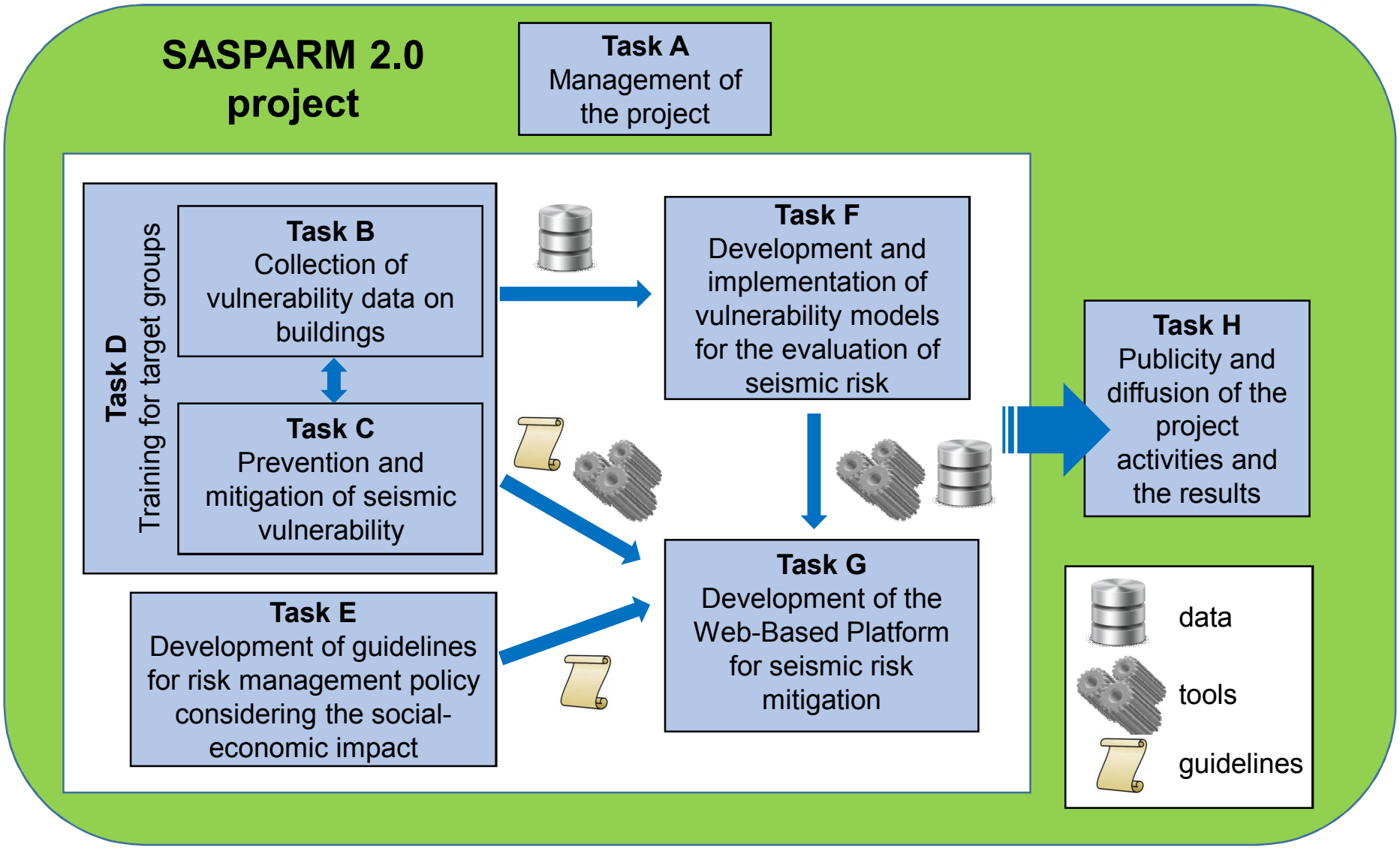


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## WebGIS platform

A Web platform has been realized in order to gather structural data collected on field.

Vulnerability and seismic risk will be assessed for each building.

Mitigation measures as a function of the identified vulnerabilities will be suggested through the platform.

The platform is equipped with GIS functionalities (WEBGIS) thanks to which the stakeholders have the possibility to identify critical conditions, since the results of seismic risk will be published in maps with a very high resolution graphical support.

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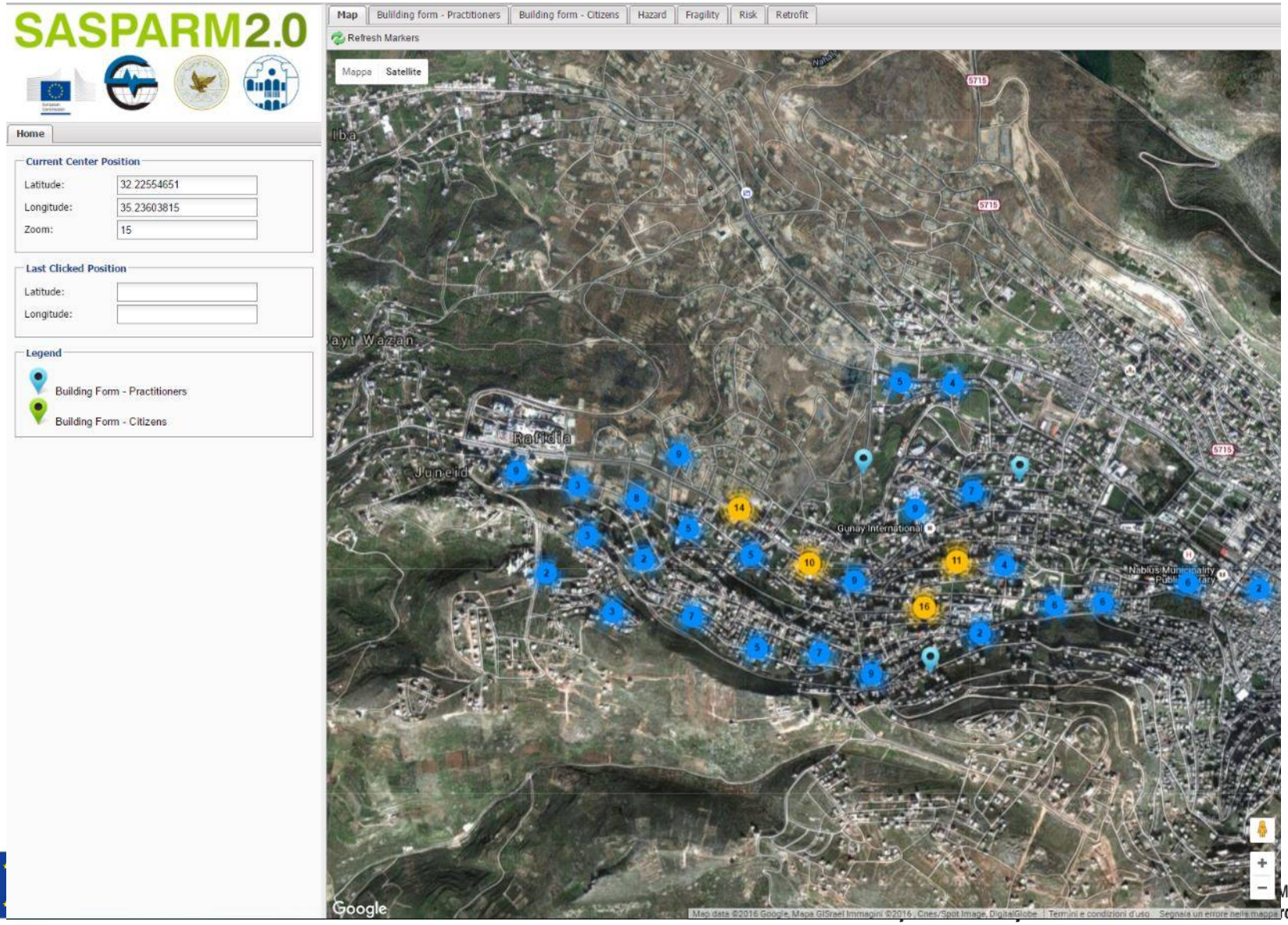
# WebGIS platform




Mitigation
rotection

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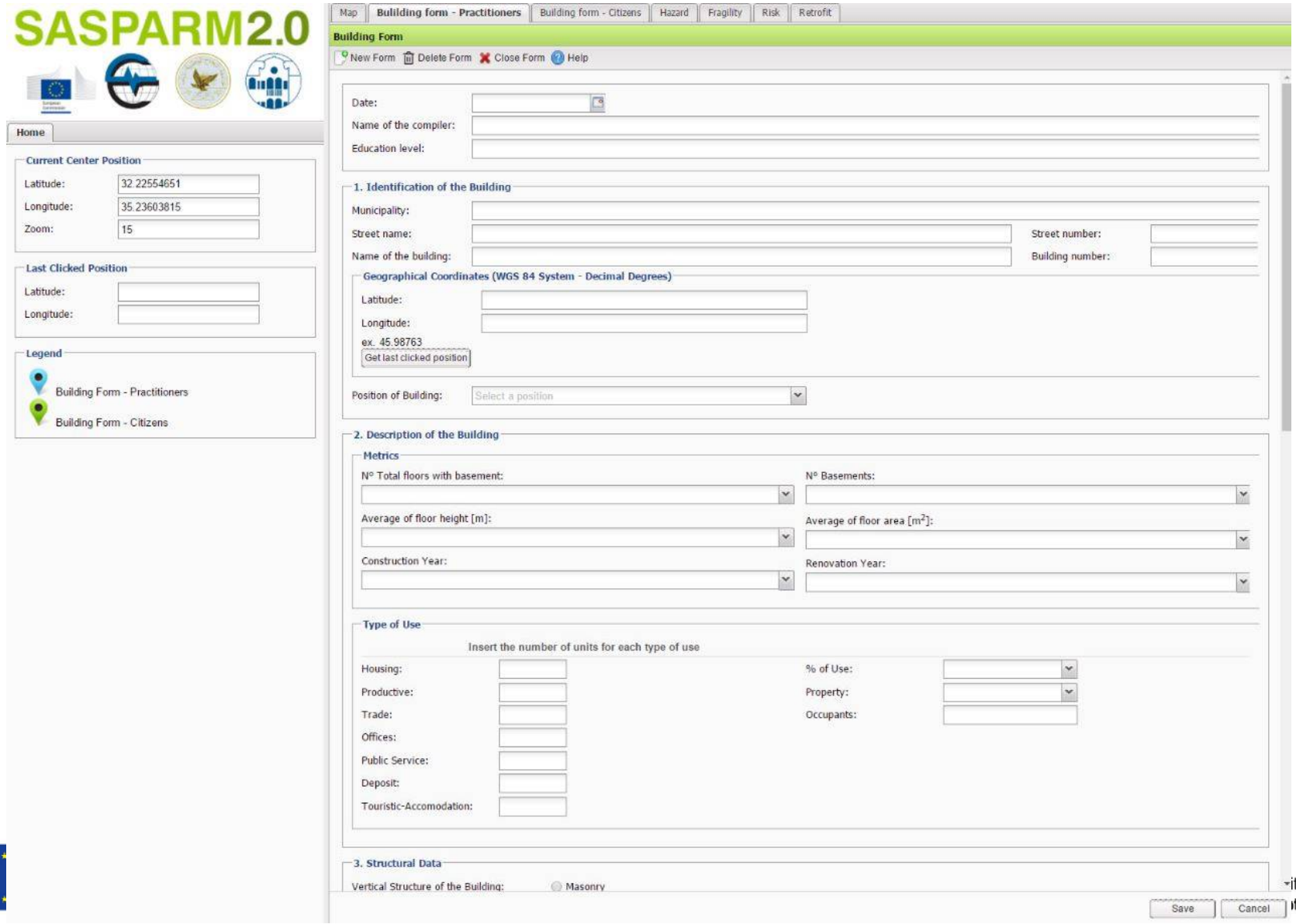
# WebGIS platform – "Building form for practitioners" section



# WebGIS platform – "Fragility curve" section

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## Courses

Training courses for **students**, **practitioners** and **citizens** have been organized with the aim to increase their awareness and knowledge of seismic risk. Practitioners and citizens have been trained to fill in the information of the collection form.

These new training courses in the field of prevention and mitigation of seismic vulnerability are organized for **practitioners** and **building contractors**. Courses will increase the capability of both local practitioners and building contractors in the design and implementation, respectively, of retrofit measures.

The increase of capability will be also facilitated trough the exchange of good practices between Partners.

## Tool for retrofit measures

Retrofit measures will be also suggested to citizens with practitioners and building contractors aid, in order to mitigate the seismic risk of their properties.

A tool, when the e-form will be filled in with the required data, will activate the correct link to the proper retrofit measure.

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# WebGIS platform – "Retrofit" section

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Home

**Current Center Position**

Latitude: 32.22554651

Longitude: 35.23603815

Zoom: 15

**Last Clicked Position**

Latitude:

Longitude:

**Legend**

Building Form - Practitioners

Building Form - Citizens

Map | Building form - Practitioners | Building form - Citizens | Hazard | Fragility | Risk | **Retrofit**

- Enhance Column and Beam with Fibre-Reinforced Polymer Composite Overlay (FRP) [§9.4]
- "Inadequate shear strength in column or beam"
  - Enhance Column or Beam with Concrete or Steel Overlay [§9.5]
  - Enhance Column or Beam with Fibre-Reinforced Polymer Composite Overlay (FRP) [§9.4]
- "Splices"
  - Enhance Column or Beam with Concrete or Steel Overlay [§9.5]
  - Enhance Column or Beam with Fibre-Reinforced Polymer Composite Overlay (FRP) [§9.4]
- "Soft storey mechanism"
  - Add Concrete Shear Wall [§9.2]
  - Add Masonry Wall [§9.3]
  - Add Steel X-Braces [§9.1].

**Torsion**

Check:

1. Shape of the building: H, I, T, L, C and U
2. px > 0.15 Lx and py > 0.15 Ly (see Fig. 1)
3. Ratio between two dimensions of building 4:1
4. Configuration of elevators (if any) along the two main axes leading to eccentricity (see Fig.2 and Fig. 3)

If 1) or 2) or 3) is true, another possible deficiency is "Re-entrant corner". The related retrofitting measures are the following:

- Add Concrete Shear Wall [§9.2]
- Add Seismic Joint [§9.18]

If 4) is true, another possible deficiency is "Torsional layout". The related retrofitting measures are the following:

- Add Concrete Shear Wall [§9.2]
- Remove RC Shear Walls.

Fig. 1. Re-entrant corner (in plan view)

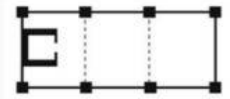


Fig. 2. Torsional Layout, C1/C1a case (in plan view)

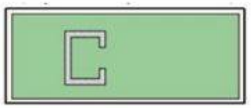


Fig. 3. Torsional Layout, C2 case (in plan view)

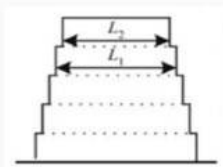
**Elevation Not Regular**

Check:

- In case of gradual setbacks preserving axial symmetry: setback at any floor shall be not greater than 20% of the previous plan dimension in the direction of the setback (see Fig. 1);
- In case of setbacks not preserving symmetry: in each face the sum of the setbacks at all storeys shall be not greater than 30% of the plan dimension at the ground floor above the foundation or above the top of a rigid basement, and the individual setbacks shall be not greater than 10% of the previous plan dimension (see Fig. 2).

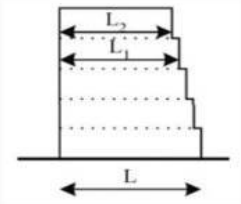
If at least one of the two conditions is met, the possible deficiency is "Reentrant corner" and the related retrofitting measure is the following:

- Add Seismic Joint [9.18].




$\frac{(L_1 - L_2)}{L_1} \leq 0.20$

Fig. 1. Setbacks with symmetry (Eurocode 8, §4.2.3.3)




$\frac{(L - L_2)}{L} \leq 0.30$ $\frac{(L_1 - L_2)}{L_1} \leq 0.10$

Fig. 2. Setbacks without symmetry (Eurocode 8, §4.2.3.3)

## Project follow up

- ✓ Extend the case study of Nablus municipality not only to all the other Palestinian municipalities but also to other Third and European Countries;
- ✓ Engage policy makers and government to foster long-term actions. Moreover, promoting Palestinian stakeholders' activities in a risk mitigation perspective with the foundation of a Palestinian Civil Protection Mechanism;
- ✓ Establish the concepts of risk governance to account for the possibility of earthquake insurance coverage (considering that the related cost would be reduced if private initiative in retrofitting world be taken);

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## Project follow up

- ✓ Ensure the maintenance of the Web-Based Platform to collect larger amounts of data on seismic vulnerability of citizens' properties first and public buildings next in order to keep the process of increasing awareness going on after the project lifetime.

- ✓ Promote new undergraduate and graduate courses on seismic risk mitigation since the training on this topic will play a fundamental role for the continuation of the project aims even after its lifetime. For this reasons, additional resources will be found to organize a new Master program in Palestine at the An-Najah National University, covering the topics of seismic risk mitigation. This action is already strongly encouraged by the Ministry of Education.