



# VULNERABILITY ASSESSMENT OF HISTORICAL CENTERS OR TOWNS AND SAFE EVACUATION IN CASE OF AN EARTHQUAKE

COORDINATING CENTRE: ECPFE Athens, Greece

PARTNER CENTRES: CUEBC Ravello, Italy, ECRP Sofia, Bulgaria

REPORT ON THE RESULTS OBTAINED WITHIN THE COORDINATED PROJECTS FOR 2014

## **ECPFE**

1.1. A scientific committee, deployed for this purpose, has carried out a methodology of a pre-earthquake assessment, adapted to Historical Masonry Structures, translated into English

The target of this methodology is the calculation of the "Seismic Risk Index of the building" potential vulnerability.

Rapid visual screening is a simplified methodology that can be quickly applied to a large set of buildings and, therefore, its reliability is inherently limited.

The second level pre-earthquake assessment is directed at masonry buildings that have received a score from the first level pre-earthquake assessment that is below a certain threshold value.

The aim of the second level pre-earthquake assessment is to re-evaluate the ranking of identified vulnerable buildings based on the detailing and evaluation of structural parameters and social criteria. This evaluation goes into more detail and requires access to all parts of the building, sketches detailing geometry and damage, visual assessment and spot checks of construction materials and basic calculations to quantify the characteristics of indexes without performing an analysis of the structure.

The benefit of this empirical Methodology is its simplicity of the calculations occurred after filling in relevant records in situ.

The sample with characteristic Monumental structures includes 36 buildings.

According to the derived index the most damaged structures will be conducted for further examination

1.2. A scientific committee has carried out the relevant dynamic analysis for four representative buildings out of the 36. These analyses will serve as a pilot study in order to validate the proposed methodology.

1.3. At the end of the year a Workshop will be organized within the Stakeholders in order to present the goals achieved.

## **CUEBC**

The research intends to provide for people involved in mitigation programmes of the earthquake effects some basic information that will enable them both to know the nature and genesis of "fabrics" in some parts of the city - that is of the "solid" areas - the buildings-, and the "void" ones - streets, yards and unbuilt spaces-, and the risks related to each specific fabric.

The way the "solid" and the "void" lots are structured is the result of a long process generating the various parts of the city. Regardless of the value of the architectural artefacts, the "fabric" of certain neighbourhoods is therefore a highly accurate document on the history of the city. The fact that in the old town centre of Naples all kinds of

solid/void relationships that characterized at various times all European cities can be found, makes its "urban pattern" an element of the city cultural heritage. A "minor" heritage, but equally important.

On the other hand, each fabric has morphological and construction characteristics able to amplify one or more of the risks that are found in urban areas in crowded conditions. Knowing the origin, the potentiality and the dangers of various fabrics may help to diminish the risk, contributing to a safer staying of strangers in the city and a more effective work of the volunteers.

Of course, this text does not purport to be exhaustive or to replace specialized studies. It is just a cognitive support designed to give the Civil Defence volunteers a simple but exact analysis tool, allowing them to learn, and recognize a widespread and also little-known (however rarely shown) aspect of the cultural heritage of the city and to focus preventive action on the characteristics of the area that will be assigned to them.

The research shows that the parts of the city characterized by community fabric (Greek-Roman core, Cavone, Vergini, Orefici, Pizzofalcone and Pallonetto S. Lucia), and the Quartieri Spagnoli are the most dangerous areas, both for the specific characteristics of the fabric and because the presence of many monuments does provide for a higher density of people present in the streets. To reduce risks and lessen the impact of emergencies, it may prove useful to:

A) In the prevention phase

1. Get a topographic map of the assigned area (i.e., a paper in which the arteries are shown with their actual width), scale 1: 4000 (available through the Office of the Master Plan of the City of Naples) and integrate it with the missing street names.
2. Inspect the area, noting the "critical points" (possible blocks caused by parked cars, probable detachment of plaster) and the potential gathering points during an earthquake (plazas and squares with width not less than 80% the height of the buildings that overlook them, vaulted entrance halls that do not show damage, large courtyards at least 80% the height of the building, or at least wider than the road).
3. Report on paper the "hot spots" and the gathering points, reporting them to the relevant departments (Safety Office of the City, Fire-fighters, Bodies in charge of producing and/or managing the Local Plans for Emergencies).
4. Identify the alternative routes to point to emergency vehicles.
5. Practice to find the formula to be used in emergency situations to briefly explain why it is dangerous to stay in the streets in the event of a fire or earthquake, what is the shortest path to reach a gathering point, because the vaulted entrance hall is secure.

B) In the emergency situation

6. Call the emergency vehicles.
7. Verify that the "hot spots" are passable and, if necessary, promptly report to the emergency vehicles the route to follow to reach the point.
8. In the event of an earthquake, direct passers-by towards the square, the courtyard or the nearest entrance hall, explaining them the nature of the hazard (falling cornices, plaster, etc.), and providing the necessary technical

information about the reasons that make sure the gathering points (in particular, doorways). At this stage, it is important to always use the same words. In emergency situations is a physiological fact that people will exchange information. If these are always concordant - among themselves and with those that come from voluntary - the word of mouth becomes adjuvant to the reassurance. Illustrating the same concepts, always using the same terms, strengthens credibility of the message and reduces the risk of being deformed.

9. In case of fire, clear out completely the roads which the concerned building overlooks and, if possible, those allegedly used by emergency vehicles.

## ECRP

In accordance with the decision adopted during the meeting of directors of the centers of European and Mediterranean Major Hazards Agreement (EUR-OPA) of the Council of Europe that took place in 2013 in Strasbourg, France - European Centre for Risk Prevention, Sofia, Bulgaria participates how partner in a project coordinated by European Centre on Prevention and Forecasting of Earthquakes (ECPFE), Athens, Greece.

After a discussion with experts from the New Bulgarian University was selected historical city of national importance. Selection was based on the fact that besides the risk of an earthquake near this town has a working nuclear plant.

After selecting of the historic town to participate in this project, a workshop was held with the participation of specialists and managers from the municipality during which reports were given by professors from the New Bulgarian University.

The following activities have been performed in 2014 by the European Centre for Risk Prevention (ECRP), Sofia within the implementation of the project "Vulnerability assessment of Historical Centers or Towns and safe evacuation in case of an Earthquake" with Coordinator – European Center ACPFE, Athens:

- Summary of materials for an earthquake in different Municipalities with Heritage and other rich monuments;
- Selection of a Historical Town with rich monumental stock;
- Description of the risks facing the proposed town and sent to coordinator;
- Hold of Work Meeting in The Historical Town (jointly with New Bulgarian University) with participation of responsible people in this area;
- Translation of the materials in English language.

All activities planned for 2014 under this project have been performed.