Interreg ADRION ADRIATIC-IONIAN
European Regional Development Fund - Instrument for Pre-Accession II Fund

ADRISEISMIC

European Union
European Regional
Development Fund

NEW APPROACHES FOR SEISMIC IMPROVEMENT AND RENOVATION OF ADRIATIC AND IONIAN HISTORIC URBAN CENTRES

ADRISEISMIC in a nutshell

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Photo on the cover:
San Francesco Church, Mirandola (Modena, IT) after the 2012 earthquake. Photo credits Giorgia Predari.

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ADRISEISMIC

INTRODUCTION

ADRISEISMIC in a nutshell

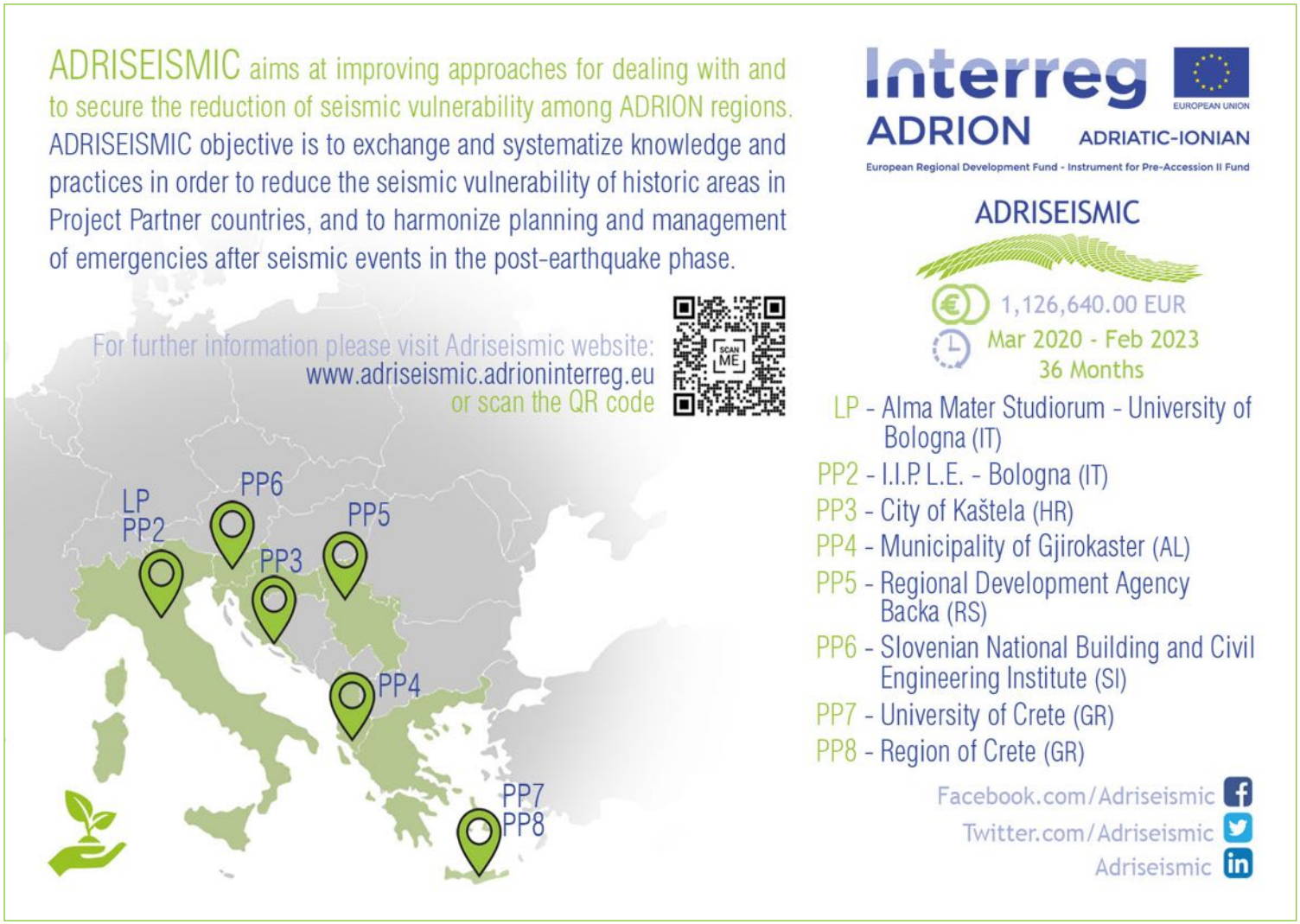
The ADRION area is heavily subject to natural hazards, and it is the highest risk earthquake area in Europe. The high vulnerability is due not only to the power of earthquakes, but also to the high population density and to the important value of the Cultural and Natural Heritage, confirmed by a large number of UNESCO World Heritage Sites and UNESCO Geoparks.

Each involved Adriatic-Ionian Region has developed laws and norms, methods and techniques as well as expertise for tackling earthquake risks and for reducing seismic vulnerability of the built environment, in particular historical heritage buildings and public squares. Nevertheless, seismic vulnerability of urban areas and particularly historical centres remains at high level. Cooperating in environmental risk prevention, management of emergencies, reconstruction and seismic retrofitting of damaged buildings can produce significant improvements in facing seismic vulnerability reduction in urban ADRION areas.

ADRISEISMIC overall project objective is to exchange and systematize knowledge and practices in tackling the reduction of the seismic vulnerability of the built environment in the six project partners' countries (Albania, Croatia, Greece, Italy, Serbia and Slovenia), to harmonize planning and management of emergencies after seismic events and the post-earthquake phase, by providing ready-to-use methods, tools and procedures that will be integrated into the existing policies and practices, thus strengthening local responses and reducing vulnerability to natural hazards. The main focus areas are the historical urban centres and historical squares and their surrounding buildings, conceived as symbol of local identity and socio-economic cores for the ADRION settlements.

The aim of this e-book is twofold: on the one hand, describ-

FIGURE 1 - ADRISEISMIC postcard



ing in detail the learning process developed within ADRISEISMIC project to stimulate the exchange of experience mainly at interregional and local levels. On the other hand, to present the main project outputs and results, which consist of the expeditious assessment methodology; 2 regional and 2 local Action Plans, developed respectively for region of Crete in Greece and region of Bačka in Serbia, and the city of Gjirokaster in Albania and the city of Kaštela in Croatia; and the Moodle Platform, conceived as a key tool for setting a new cooperation network while improving skills and expertise concerning seismic vulnerability reduction. The ADRISEISMIC e-book can be a useful reference for those who are interested in establishing an exchange of experience process among peers that are dealing with the same topics and co-designing tailored solutions at regional and local level with the active involvement of the local stakeholders.

The partnership

The partnership involves 8 partners from 6 European countries: Albania, Croatia, Greece, Italy, Serbia and Slovenia, ranging from municipalities, regional authorities and development agencies to universities, research and training centres. The added value of the project partnership is represented by its variety, expertise and complementarity and its willingness to exchange experiences and define a common methodology and common practices to reduce the seismic vulnerability of the involved Regions.

The project coordinator is the Department of Architecture of the University of Bologna which provides expertise in the integration of sustainability principles into urban planning and in the seismic vulnerability assessment of aggregates of buildings. The Municipality of Gjirokaster, the City of Kaštela, the Region of Crete and the Regional Development Agency Bačka are, respectively, the local and regional authorities that ensure the transferability of ADRISEISMIC results, adopting Action Plans and testing the innovative methodologies produced in the framework of the project in the Pilot cases. The University of Crete and the Slovenian national building and civil engineering institute bring expertise, respectively, in the field of disaster prevention and vulnerability reduction, and competences in the development of seismic risk assessment methodologies and towards the harmonisation and establishment of a shared legislative framework of seismic norms for the ADRION area. Finally, the Institute for Vocational Training of Construction Workers in the Province of Bologna brings the necessary exper-

tise to develop new training programmes for all the actors involved in the seismic retrofitting process.

The consortium has been working together for three years, building a solid state of the art of the ADRION area in the field of seismic risk assessment methodologies, legislative and regulative context and instruments, seismic-related training offer. It has been the starting point towards the development of new methodologies for the assessment of seismic risk at urban level, new pathways for increasing the resilience of local contexts towards seismic risk, and increase competences and skills of practitioners, civil servants, building workers and volunteers.

LP	*Alma Mater Studiorum, University of Bologna, Department of Architecture - Italy*
PP2	*Institute for Vocational Training of Construction Workers in the province of Bologna (I.I.P.L.E.) - Italy*
PP3	*City of Kaštela - Croatia*
PP4	*Municipality of Gjirokaster - Albania*
PP5	*Regional development agency Bačka - Serbia*
PP6	*Slovenian national building and civil engineering institute (ZAG) - Slovenia*
PP7	*University of Crete - Greece*
PP8	*Region of Crete - Greece*

Alma Mater Studiorum, University of Bologna, Department of Architecture - Italy

Funded in 1088, the University of Bologna is one of the most important institutions of higher education across Europe. The research team involved in ADRISEISMIC project belongs to the Department of Architecture (DA), and specifically it is a joint group with urban planning and architectural engineering competences. The urban planning group has expertise in the field of spatial planning and environmental assessment, and it is deeply involved in the integration of sustainability principles as well as seismic vulnerability evaluations of aggregates of buildings into urban planning. The architectural engineering research group deals with the evaluation of the seismic vulnerability of masonry historical buildings and with the issue of seismic prevention. Within the project, the role of the DA has been twofold: on one hand it has contributed to the development of a comparative analysis of norms and practices used in different European contexts with the aim to harmonise the regulative framework and overcoming barriers for the reduction of seismic risk of historic areas. On the other hand, a tool for the expeditious assessment of seismic vulnerability for building aggregates has been developed and applied in different contexts, beyond the Italian one in order to test and validate it. Lastly, the DA has been responsible of applying the new methodology on its own university buildings in the hearth of the historical city center of Bologna.

Institute for Vocational Training of Construction Workers in the province of Bologna (I.I.P.L.E.) - Italy

The Institute for Vocational Training of Construction Workers in the province of Bologna (I.I.P.L.E.) was founded in 1947. It deals with the training of all the professional profiles of the building industry to provide skills and expertise to all the employees of the construction sector, to the professionals and also to the young unemployed people. The rationale behind the Institute is to develop and transfer the practical and theoretical professional skills in order to improve the quality of the construction sector by combining the preservation of traditional training with the innovation of teaching tools. With regard to ADRISEISMIC project, I.I.P.L.E. has been providing its expertise in preparing new and more effective education programmes and homogeneous qualifications in the sector, enhancing the competencies and the skills of all the technicians and other stakeholders involved in the construction process. Furthermore, I.I.P.L.E. has contributed to the definition of tailored training programmes for professional figures to be spread transnationally, providing high quality and homogeneous qualifications in the sector.

City of Kaštela - Croatia

The City of Kaštela has experience in improving the capacities for sustainable use of cultural heritage through development of innovative management tools to protect and minimize the impact of harmful weather conditions. However, the widespread presence of cultural heritage across the City of Kaštela has not yet been sufficiently valorised and enhanced, even though it represents a significant touristic resource. The organizational structure of the city includes seven historic settlements, and Kaštela recognized the need for protection, management and sustainable utilization of cultural heritage as well as for strengthening the segment of sensitivity and the resistance of cultural heritage in extreme conditions. ADRISEISMIC project has represented the opportunity to cooperate with other partners to develop innovative strategies for the conservation of heritage buildings and establishing a shared legislative framework on the basis of harmonisation of seismic codes. The city of Kaštela is also responsible for the development of a pilot action on which innovative methodologies and tools for the rapid evaluations of seismic vulnerability of its built heritage have been applied and tested. Finally, the City of Kaštela had the opportunity to access trainings and workshops to transfer this knowledge and experience to the local professionals involved in the process.

Municipality of Gjirokaster - Albania

This Municipality of Gjirokaster is listed among the UNESCO dossier of World Heritage cities and it has adopted in 2006 the first urban regulation for the historic centre of the country, whose main objective is to face the challenges of the sustainable development of the city, protecting its heritage value. The city is rich in cultural heritage and protecting it from unpredictable factors as earthquakes is one of the main priorities of the Municipality. Within the project, the Municipality of Gjirokaster has been a base on which to build a shared and innovative regulative framework and define more effective processes for the reduction of the seismic vulnerability of cultural heritage buildings. In this regard, the city has been responsible of drafting an action plan to endorse some of the project results at local level, tailoring them to the Albanian context. Finally, the municipality had the opportunity to access trainings and workshops to transfer this knowledge and experience to the local professionals involved in the process.

Regional development agency Bačka - Serbia

Regional Development Agency Bačka was funded by local municipalities in the region of Bačka in order to strengthen capabilities of local municipalities, improve socio-economic development of the region and to create possibilities for mutual cooperation. The region is rich in cultural heritage and, through the ADRISEISMIC project, historic areas have been valorised, providing better living conditions to the inhabitants and increasing attractiveness. The harmonisation of the norms concerning the management of the seismic risk and the related interventions on buildings with historical value, have created the opportunity for the Agency to develop specific activities with the regional and local administrative bodies for the implementation of such innovative regulations. Furthermore, the Agency has been in charge of developing the regional action plan, in which actions are foreseen to transfer the knowledge of the project to the Bačka regional context, aiming at innovating the practices and the processes of intervention in areas characterized by seismic vulnerability and heritage value. In addition, the Agency enabled the transfer of the acquired knowledge and expertise to all the local actors (professionals and non-professionals) involved in the process of seismic improvement interventions, and creating new job opportunities.

Slovenian national building and civil engineering institute (ZAG) - Slovenia

The Slovenian national building and civil engineering institute (ZAG) is active in the field of masonry and reinforced concrete structures and their behaviour when exposed to seismic loads, as well as in the research and development of methods for repairing and strengthening of masonry structures. In addition, the Institute has been traditionally involved in the preparation of national strategies for the protection from earthquakes, has been active in the post-earthquake activities in Slovenia and abroad. Thanks to this expertise, ZAG cooperated together with the other partners to establish a shared legislative framework on the basis of harmonisation of seismic codes within partner countries. In addition, ZAG contributed to the discussion about different methods used for analysis of materials and structures of heritage buildings as well as structural strengthening techniques. Its expertise in developing POTROG - Rapid Response System and some other web applications for a comprehensive risk management has supported the development of the new ADRISEISMIC expeditious assessment methodology.

University of Crete - Greece

The University of Crete, is a multi-disciplinary, research-oriented Institution, situated in the cities of Rethymno and Heraklion. The Natural History Museum of Crete (NHMC), established in 1994 as a body of the University, is the entity part of the University of Crete involved in the ADRISEISMIC project. The NHMC is targeted on the research, management and conservation of natural environment and on raising awareness and training around risk mitigation and climate change. Within the project, the University of Crete shared its advanced knowledge in the field of disaster prevention and vulnerability reduction, especially with reference to the specific construction techniques of the area and awareness raising activities for citizens, authorities and visitors. Finally, they led the definition of innovative training toolkit for volunteers, as well as contributed to the definition of the contents of the training packages for all the actors involved in the seismic retrofitting process.

Region of Crete - Greece

Based in Heraklion, the Region of Crete is a second-degree local administration body. Due to the high exposure of the island to earthquakes, the Region has gained a relevant experience in the prevention of damages. Furthermore, the case of Crete is extremely relevant for the project as in the Islands there are many historical centres and buildings with high heritage significance. In ADRISEISMIC, different departments of the administrative structure of Region of Crete have been involved, bringing to the project different competences such as spatial planning, public health, social care and environment. The Region of Crete shared with others project partners its experiences on advanced regulative framework and procedures developed in the field of seismic preparedness and seismic vulnerability reduction. Furthermore, the Region has been in charge of developing the regional action plan, in which actions are foreseen to transfer the knowledge of the project to the regional context, aiming at innovating the practices and the processes of intervention in areas characterized by seismic vulnerability and heritage value. The Region of Crete is also responsible for the development of a pilot action on which innovative methodologies and tools for the rapid evaluations of seismic vulnerability of its built heritage have been applied and tested. Finally, the Region had the opportunity to access trainings and workshops to transfer this knowledge and experience to the local professionals involved in the process.

Associated Partners

Besides the project partners, thirteen Associated Partners have also been involved to support the development of the activities and enlarge the cooperation network.

1 *Municipality of Appignano del Tronto (IT)*

2 *Region of Epirus (GR)*

3 *ANCE Emilia-Romagna (IT)*

4 *Consortium FORMEDIL Emilia-Romagna (IT)*

5 *Municipality of Bologna (IT)*

6 *Municipality of Elbasan (AL)*

7 *Venice building center - training & security (IT)*

8 *Provincial Secretariat for Culture, Public Information and Relations with Religious Communities, Government of AP Vojvodina (RS)*

9 *National Association of Italian Municipalities - Region Marche (IT)*

10 *Earthquake Planning and Protection Organization (GR)*

11 *Hellenic Ministry of Culture and Sports, Ephorate of Antiquities of Rethymno (GR)*

12 *UniAdrion (IT)*

13 *ICLEI European Secretariat GMBH (IT)*

FIGURE 2 - (a,b) 2020 Petrijna earthquake in Croatia © Mislav Stepinac; (c) 2021 Thessalia earthquake in Greece © Ministry of Culture and Sports; (d,e) 2012 Emilia-Romagna earthquake in Italy © Giorgia Predari.

SECTION 1:
THE ADRISEISMIC METHODOLOGY

Main features

Each involved Adriatic-Ionian Region has developed laws and norms, methods and techniques as well as expertise for tackling earthquake risks and for reducing seismic vulnerability of built up areas. Nevertheless, seismic vulnerability of urban areas and particularly historical centers remains at high level.

Cooperating in environmental risk prevention and management of emergencies after a seismic event, in reconstruction and seismic adaptation of damaged buildings can produce significant improvements in facing seismic vulnerability reduction in urban ADRION areas. Transnational cooperation and transferability of the project results is an integral part of ADRISEISMIC. First of all, strategies and methodologies have been designed taking into account the applicability of the developed standards, tools and methods to the historic built environment in other regions within the ADRION area and beyond.

The coherence between the investigation of the state of the art, the project objectives and outcomes have been ensured through the organisation of a **series of Workshops** and the involvement of relevant stakeholders (e.g., research institutions, regional and local bodies, professional training organisations and schools, urban planners and construction sector associations) from the very first stage of the project implementation. Project partners have contributed to the exchange of challenges and practices through the organisation of six **Study Visits**, where they have shown the characteristics of their cultural heritage-built environment and methods in use for seismic vulnerability retrofitting. The project methodology has been tested within the consortium by implementing the proposed methods and tools in three **Pilot cases**; in this way, the generalization of the solutions and their adaptation to different contexts have been guaranteed.

In the following sections, the three main tools applied to support knowledge are presented.

Workshops

Local workshops have been key activities in the development of ADRISEISMIC project. They have been conceived as local meetings between the project partner and the local stakeholders to validate the project outputs and maximise the durability of the project results. In this respect, all the interested parties directly benefitted from the participation to these events since the local workshops foreseen during project lifetime allowed to transfer the knowledge generated within the project to the competent policy-making bodies at different territorial levels, and to make it available to additional territories and institutions.

A series of four rounds of local workshops – one every six months – has been organised in each country involved in the ADRISEISMIC project, leading to 24 workshops. The specific objectives of each single round of local workshops have been related to the technical activities carried out by the project partners in the specific semester. Furthermore, the workshops have also served as an occasion to attract and engage further target groups into project activities.

The target groups of local workshops can be considered those people useful for the development of project activities through fruitful discussion and in the validation of the achievements of the project. In general, it is possible to refer to all potential stakeholders. Among others:

- Policy: regional and local governing bodies, territorial development institutions, sectoral agency etc.
- Public: residents, associations, schools, local action groups, civil society organizations, interest groups including NGOs, etc.
- Research: universities and research institutes
- Training centres and schools
- Enterprises and Association of Enterprises operating in the building and construction sector, focused on restoration and retrofitting of historical buildings.

The Covid-19 pandemic affected the modality of all the ADRISEISMIC local workshops. Nevertheless, the project partners managed to organise the first two series of events in a remote modality and they moved towards a hybrid or in presence modality for the following ones, if the local conditions allowed it. Before the event, each project partner prepared the necessary material to present the project and to support the thematic discussion, by collaborating constantly with the leaders of the technical work packages. All workshop's presentations were structured with the aim to introduce the results achieved so far by the project and to present the activity of the workshops and the expected

results. After the event, each project partner was asked to draft an event report indicating general information (e.g., venue, date, duration, number of female/male participants), summarising the key takeaways from the workshop and highlighting the most relevant observations, comments and further recommendations made by the participants. Photos, screenshots of the key slides of the presentations and the event's agenda were to be gathered in the event report as well. As part of the monitoring procedures to assess the consortium activities, an evaluation survey was launched after each event to collect the feedback from the stakeholders. National languages have been used to perform the workshop and maximize the inclusion of stakeholders. According to the information provided through the event reports, the gender distribution was monitored and it resulted to be well balanced.

Pilot cases

The ADRISEISMIC expeditious assessment methodology (see Section 2) has been applied to three Pilot Actions in Bologna (Italy), Rethymno (Greece) and Kaštela (Croatia), to test its validity and procedures formulated within the project. They are intended as preparatory activities to test the proposed solutions, making them adaptable and showing how they can be replicable to each specific context. With these premises, it was jointly decided to propose 3 different case studies with the same characteristics in the three different countries:

- open spaces in the historic centre (i.e., squares or streets), taking into account that in these places, buildings of cultural value are concentrated, and the local population intensely lives them;
- with relevant public or social functions, as these increase the number of people present inside the buildings;
- with both pedestrian and vehicular traffic, as this coexistence increases the risk for pedestrians in the case of a seismic event;
- with both masonry and reinforced concrete buildings (whenever possible), to validate both procedures.

During periodic meetings with the partners involved in this project phase, the procedure was shared, including geometric survey methods, acquisition of available documentary or archival material, graphic restitution, direct investigations, application of the methodology, and comparison of the results.

The necessary documents for implementing the Pilot cases

were defined as:

- at least an aerial photo of the square (or a direct survey if possible) because a very high data accuracy is not required;
- the direct survey of the plans or cadastral plans of the buildings, for at least a width of 6-10 meters behind the facades;
- the direct survey of the facades; as an exact geometric survey is not necessary, it was recommended to proceed with photogrammetry;
- knowledge of the structural characteristics of the buildings.

Additional details on the Pilot cases are provided in Section 2.

Study visits

ADRISEISMIC has foreseen 6 Study visits, developed at project level. The aim of the Study Visits was twofold: on the one hand they allowed to organize in situ observations with other project partners and other relevant stakeholders to show the characteristics of cultural heritage-built environment and methods in use for seismic vulnerability retrofitting. On the other hand, Italy, Croatia and Greece have organised their Study Visits to share their work on the pilot activities, thus showing how the methods for seismic vulnerability retrofitting and assessment are applied. Each country, alternatively, has hosted the partners of the other nations, thus having the opportunity to illustrate the typical practices of the place, enriching the discussion and the shared technical knowledge.

Due to the Covid-19, three study visits were organised remotely only (in Serbia, Slovenia and Albania), while in those countries where Pilot cases are located (Italy, Croatia and Greece), the Study Visits were organised mostly according to plans, but in a blended modality.

SECTION 2:
ADRISEISMIC OUTPUTS AND RESULTS

ADRISEISMIC in numbers

The methodology led to the achievement of important results and outputs. A synthesis of the activities and the main outcomes produced is presented below, followed by the detailed description of the main results achieved.

Activities and Meetings

3	Virtual study visits in Albania, Serbia and Slovenia
3	Study visits in Crete, Kaštela and Bologna
24	Local workshops with key stakeholders
31	Remote meetings with all the partners

Outputs

2	Regional Action Plans comprising of 7 actions in total
2	Local Action Plans comprising of 10 actions in total
21	Good Practices identified
6	Roadmaps, one project country each
1	Innovative expeditious assessment method for seismic risk assessment of both masonry and reinforced concrete buildings
1	Moodle Platform supporting transnational cooperation
3	Training packages targeted to civil servants, practitioners, building workers
1	Training toolkit for volunteers

The ADRISEISMIC expeditious assessment methodology and outcomes from the application in the three Pilot cases

Most buildings in historical centres are not structurally designed to support horizontal actions. The consequence is a widespread seismic vulnerability in most European countries. Furthermore, in the countries involved in the ADRISEISMIC project, high vulnerability is also associated with high hazard, resulting in a high seismic risk.

The main causes of seismic vulnerability are often linked to the construction period the structures date back, which predates the adoption of specific technical regulations for design in seismic zones. This leads to criticalities that can characterise both reinforced concrete and masonry buildings. For reinforced concrete buildings, the most frequent weaknesses are linked to the use of poor-quality materials with low resistance, as well as inefficient technical details. For masonry buildings, on the other hand, they are poor masonry quality, unconnected load-bearing elements, and original layout transformation over time.

The countries participating in the ADRISEISMIC project have different social, economic, and cultural backgrounds. However, a preliminary survey identifying the most common building techniques showed strong similarities. Specifically for masonry constructions, uniformity has been observed both in the periods of diffusion and in the methods of use. Specific differences concerning the type of masonry used are strongly linked to local material availability: brick masonry is found in clay-rich areas, tuff is used in volcanic regions, etc. There is also a strong use of wooden floors in all countries, probably due to the ease of craft typical of the material and its ability to resist tensile stress. These floors were replaced over the years, first with iron beams and brick elements, then, in recent times, with concrete joists. Understanding the real state of buildings is really important to assess its vulnerability, and becomes even more important in historic city areas, as they are usually characterized by construction with a high historical and architectural value. In addition, historical sites are often densely populated, which is fundamental from the point of view of human safety. Preserving historic buildings means preserving the history of a city.

Masonry has been used as a construction technology in historic urban and rural areas for thousands of years. Although reinforced concrete and steel have emerged as the most commonly used construction materials for modern buildings, masonry structures have continued to be widely used worldwide due to their advantages, such as availability of materials, durability, good thermal resistance, and low cost. The review conducted in the first phase of the ADRISEISMIC project has shown that existing masonry build-

ings constitute 45% to 61% of the built heritage in partner countries. A high seismic vulnerability usually characterizes existing masonry structures. Still, their seismic behaviour is complex and depends on several factors, including the material properties, geometry, foundations, connections between walls and floors, connections between walls and roof, stiffness, and the building condition. The seismic performance of existing masonry structures has received significant attention in recent decades, as masonry properties directly influence the seismic response of this type of building, and massive damage has been observed during strong earthquakes. In general, the damage in unreinforced masonry buildings due to the seismic action is in the form of cracks between walls and floors, cracks at the wall corners and intersections, the out-of-plane collapse of the external walls, diagonal cracks in structural walls, partial disintegration or failure of walls, and partial or complete building collapse. Construction quality is certainly a fundamental aspect, which is generally influenced by a structural scheme and by each element's current structural integrity. Based on the targeted survey, it is possible to identify appropriate intervention criteria for any particular local situation and expected earthquake intensity.

Also reinforced concrete buildings represent a significant part of the existing building stock, especially for the buildings constructed since the first half of the 20th century. Construction of residential, school and office buildings using reinforced concrete started from 1900-1920, and its application has significantly expanded since the 1950s. In this regard, reinforced concrete buildings were solely based on vertical loads in the past. Enforcement of seismic design regulations in the ADRISEISMIC countries has changed the design approach, which considered horizontal seismic forces in addition to vertical loads. Many reinforced concrete buildings constructed before the enforcement of seismic design codes are vulnerable to seismic effects due to one or more deficiencies not addressed by the old design standards. If a reinforced concrete building was designed only for the effects of vertical loads or for horizontal loads less than those required by current codes, the resistance is probably inadequate. Localized failures in structural elements may be expected, contributing to developing a global collapse mechanism in the structure. From the expeditious assessment procedures point of view, a rather heterogeneous situation was found. The preliminary survey work provided state-of-the-art in the project countries, highlighting that there is no uniformity in terms of simply assessing the seismic vulnerability of the existing building heritage. Some countries have specific procedures, while others act only with quantitative assessments, therefore with a huge expenditure of resources if we consider the breadth and complexity of the built environment.

During the project, two parallel expeditious methodologies were defined (one dedicated to reinforced concrete-framed buildings, the other to unreinforced masonry buildings) that could be consistent with the desired results. The proposed methods share a similar structure regarding configuration, labels, and symbols, and they can be used on a large scale (processing many buildings quickly) or on a single structure. The input phase (asking the compiler for essential informa-

tion about the structure) is followed by the output phase, where the most probable collapse mechanism, the seismic risk and the structural response index are defined. A final section was implemented, where a structural improvement

Description of the expeditious assessment method

All the conditions mentioned above and the observation that there is no uniformity of approach among the project partner countries lead to the definition of the expeditious methods in the ADRISEISMIC context.

The starting point has been an analysis of state of the art in the countries involved in the project. The results showed that in some countries the practice of expeditious assessment is already widely used, while in others, it is either absent or not widespread. The use of a well-designed method could not only consolidate already widespread practices but also broaden the potential users, generating the common knowledge that is the programme's ultimate goal.The key features for the application of the new methodology in the study areas are outlined below, aiming at guaranteeing consistency with the project strategies:

1. **Evaluation of two types of vertical load-bearing structures**: reinforced concrete and masonry structures. The results obtained from the assessment of the two types of structure should be consistent with each other.
2. **The assessment is performed quickly**: the method, as mentioned, to be truly expeditious, should have taken an operator no more few minutes to obtain the vulnerability assessment of the structure under investigation.
3. **Input information is easily accessible**: the objective of the ADRISEISMIC project is to carry out large-scale investigations. This aspect inevitably requires adopting a method that provides quick surveys and information, if not obtainable, at least conceivable.
4. **Clarity of presentation of final results**. The system should provide values easily interpreted by non-experts (rankings, coloured signs or others). This would allow immediate use of the information obtained and the desired understandability.

The method was structured in three distinct phases:

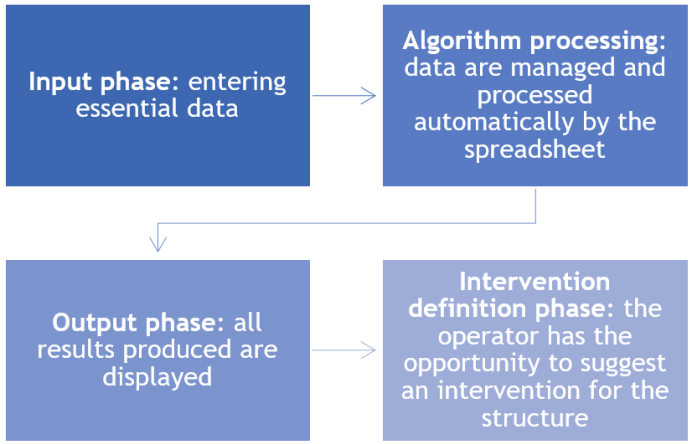
1. **The first is the data input phase**. At this stage, an operator is asked for all the information, which helps assess the structure. It starts with generic data, used for archiving purposes, up to the essential data for the algorithm process.
2. **The second phase is the output phase**. In this phase, a spreadsheet is used for the assessment of the structure. It was not intended to reduce everything to a single data but to provide an operator with as much information as possible for a more comprehensive reading of a structure and more informed action on possible inter-

ventions or further analysis.

3. **The last phase regards building interventions**. An intervention can be chosen for each building from those collected in the project's first phase. This way, the operator can preliminarily hypothesise how to act on the building pending more in-depth investigations.

The layout is the same for both concrete and masonry. Consistent with the objectives outlined above, entry data in both spreadsheets are as simple as possible. Using simple symbols makes data entry intuitive for all operators, bypassing the language limitation. In addition, the possibility of using qualitative rather than quantitative values keep the assessment procedure expeditious, ensuring that data not directly derived from the survey can be assumed.

FIGURE 3 - Operational steps in the method



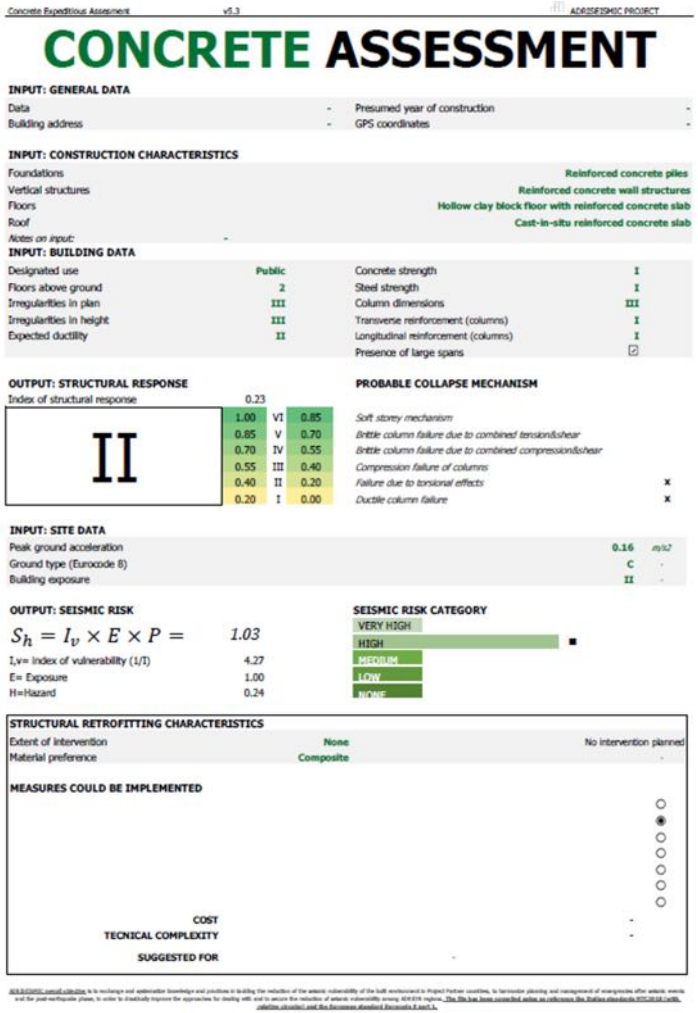
The output data were organized with the same logic as the input data. The system thus maintains the consistency initially sought, standardising the vulnerability scale for both load-bearing masonry and reinforced concrete. The most significant results, provided for both structural types, are:

- Index of structural response
- Seismic risk
- Most probable damage mechanism

The method overall has been structured as a primary investigation tool. It must be intended to provide a qualitative assessment of extensive built-up areas concerning the seismic capacity of the buildings under investigation.

The proposed expeditious method has been applied in the Pilot cases of the project and have been validated using a sample of buildings, 25 in unreinforced masonry and 10 in reinforced concrete, whose structural response had previously been analysed using traditional analysis systems. Comparing the methodologies (the proposed and the traditional ones) provided the first numerical results regarding the accuracy of the two proposed systems (Figure 4).

FIGURE 4 - excel spreadsheets of the reinforced concrete method (left) and the masonry method (right)



Concrete Expeditious Assessment v5.3 ADRISEISMIC PROJECT

CONCRETE ASSESSMENT

INPUT: GENERAL DATA

Data	-	Presumed year of construction	-
Building address	-	GPS coordinates	-

INPUT: CONSTRUCTION CHARACTERISTICS

Foundations	Reinforced concrete piles
Vertical structures	Reinforced concrete wall structures
Floors	Hollow clay block floor with reinforced concrete slab
Roof	Cast-in-situ reinforced concrete slab
Notes on input:	-

INPUT: BUILDING DATA

Designated use	Public	Concrete strength	I
Floors above ground	2	Steel strength	I
Irregularities in plan	III	Column dimensions	III
Irregularities in height	III	Transverse reinforcement (columns)	I
Expected ductility	II	Longitudinal reinforcement (columns)	I
		Presence of large spans	☑

OUTPUT: STRUCTURAL RESPONSE

Index of structural response 0.23

II

1.00	VI	0.85
0.85	V	0.70
0.70	IV	0.55
0.55	III	0.40
0.40	II	0.20
0.20	I	0.00

PROBABLE COLLAPSE MECHANISM

Soft storey mechanism	
Brittle column failure due to combined tension&shear	
Brittle column failure due to combined compression&shear	
Compression failure of columns	
Failure due to torsional effects	x
Ductile column failure	x

INPUT: SITE DATA

Peak ground acceleration	0.16	m/s2
Ground type (Eurocode 8)	C	-
Building exposure	II	-

OUTPUT: SEISMIC RISK

$S_h = I_v \times E \times P =$ 1.03

I,v= Index of vulnerability (1/I)	4.27
E= Exposure	1.00
H=Hazard	0.24

SEISMIC RISK CATEGORY

VERY HIGH
HIGH ■
MEDIUM
LOW
NONE

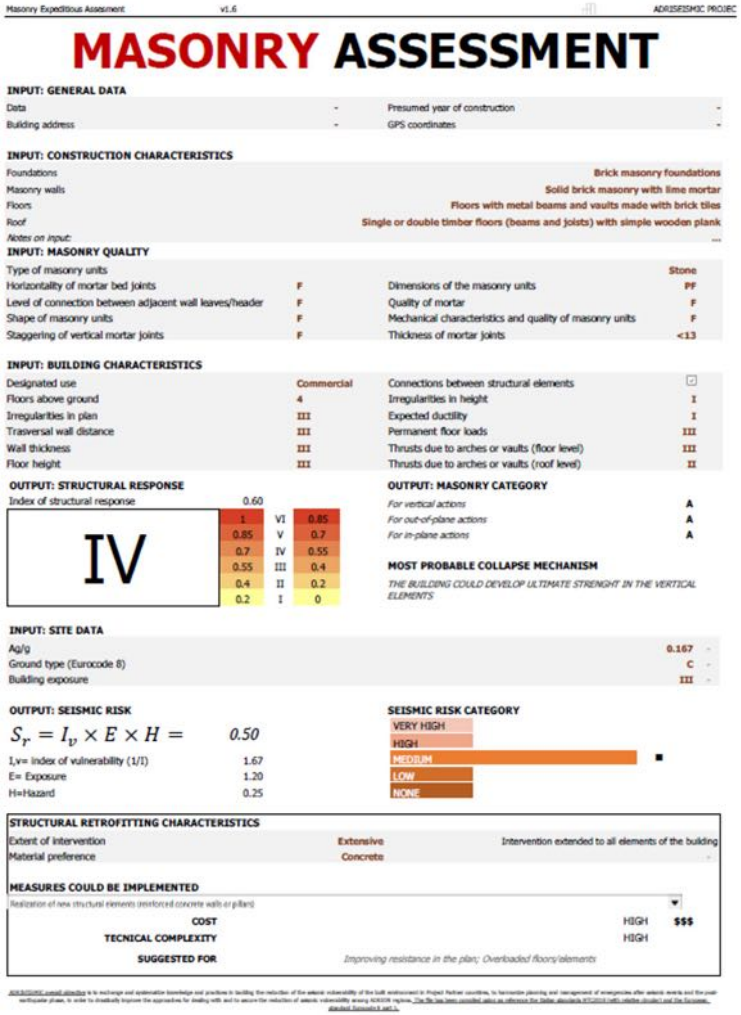
STRUCTURAL RETROFITTING CHARACTERISTICS

Extent of intervention	None	No intervention planned
Material preference	Composite	-

MEASURES COULD BE IMPLEMENTED

○ ◉ ○ ○ ○ ○ ○

COST	-
TECNICAL COMPLEXITY	-
SUGGESTED FOR	-



Masonry Expeditious Assessment v1.6 ADRISEISMIC PROJEC

MASONRY ASSESSMENT

INPUT: GENERAL DATA

Data	-	Presumed year of construction	-
Building address	-	GPS coordinates	-

INPUT: CONSTRUCTION CHARACTERISTICS

Foundations	Brick masonry foundations
Masonry walls	Solid brick masonry with lime mortar
Floors	Floors with metal beams and vaults made with brick tiles
Roof	Single or double timber floors (beams and joists) with simple wooden plank
Notes on input:	-

INPUT: MASONRY QUALITY

Type of masonry units			Stone
Horizontality of mortar bed joints	F	Dimensions of the masonry units	PF
Level of connection between adjacent wall leaves/header	F	Quality of mortar	F
Shape of masonry units	F	Mechanical characteristics and quality of masonry units	F
Staggering of vertical mortar joints	F	Thickness of mortar joints	<13

INPUT: BUILDING CHARACTERISTICS

Designated use	Commercial	Connections between structural elements	☑
Floors above ground	4	Irregularities in height	I
Irregularities in plan	III	Expected ductility	I
Trasversal wall distance	III	Permanent floor loads	III
Wall thickness	III	Thrusts due to arches or vaults (floor level)	III
Floor height	III	Thrusts due to arches or vaults (roof level)	II

OUTPUT: STRUCTURAL RESPONSE

Index of structural response 0.60

IV

1	VI	0.85
0.85	V	0.7
0.7	IV	0.55
0.55	III	0.4
0.4	II	0.2
0.2	I	0

OUTPUT: MASONRY CATEGORY

For vertical actions	A
For out-of-plane actions	A
For in-plane actions	A

MOST PROBABLE COLLAPSE MECHANISM

THE BUILDING COULD DEVELOP ULTIMATE STRENGHT IN THE VERTICAL ELEMENTS

INPUT: SITE DATA

Ag/g	0.167	-
Ground type (Eurocode 8)	C	-
Building exposure	III	-

OUTPUT: SEISMIC RISK

$S_r = I_v \times E \times H =$ 0.50

I,v= Index of vulnerability (1/I)	1.67
E= Exposure	1.20
H=Hazard	0.25

SEISMIC RISK CATEGORY

VERY HIGH
HIGH
MEDIUM ■
LOW
NONE

STRUCTURAL RETROFITTING CHARACTERISTICS

Extent of intervention	Extensive	Intervention extended to all elements of the building
Material preference	Concrete	-

MEASURES COULD BE IMPLEMENTED

Realization of new structural elements (reinforced concrete walls or pillars) ▼

COST	HIGH	$$$
TECNICAL COMPLEXITY	HIGH	
SUGGESTED FOR	*Improving resistance in the plan; Overloaded floors/elements*	

Outcomes from the Pilot case applications

To verify the proposed methodology, a test and evaluation activity in real environments has been performed. The University of Bologna, the city ok Kaštela and the Region of Crete have developed one pilot case each, where to cunduct surveys and apply the porposed methodology.

The three areas have been fundamental in providing immediate feedback regarding the theoretical work carried out in parallel, allowing the opportunity to evaluate both operational-procedural aspects and those related to the structural assessment algorithm. The pilot areas have been chosen based on certain criteria defined a priori, linked to the general objectives of the ADRISEISMIC project:

- Buildings facing historical squares. The project chose to analyse these areas because they are often very vulnerable to seismic risk: the buildings are usually dated and present extremely articulated configurations (aggregates). In addition, the implementation of structural improvement works is complex. Moreover, the buildings present peculiar architectural features, which contribute to defining the identity of the urban centre where they are located.
- Areas comprising both masonry and concrete load-bearing structures.These two structural types are the most widespread in the partner countries and, consequently, those selected for applying the methods of expeditious assessment.
- Areas accessible for surveying and that guaranteed ease of retrieval of historical-archival documentation. The last criterion was defined to enable the analysis of the pilot actions within the project timeframe.

The defined principles led to the selection of the three areas for the project: Piazza Puntoni in Bologna (Italy), Podvorje square in Kastela (Croatia) and Sohora square in Rethymno (Greece). Figure 5 shows a satellite view of the three areas.

FIGURE 5 - Satellite views of the three Pilot cases: (a) Piazza Puntoni (Italy); (b) Podvorje square (Croatia); (c) Sohora square (Greece). © Google Maps

Italian Pilot case: Piazza Puntoni, Bologna

The Piazza Puntoni area is located in the historic centre of Bologna, within the University district, as shown in Figure 6. Its particular shape is due to the many urban transformations that have taken place over the years. The most recent, in the 1930s, reconfigured the entire area, giving it the appearance it still has today.

The buildings that surround it are very heterogeneous, both in terms of the period of construction, the construction techniques, and the functions they are used for (classrooms, private homes, shops, museums, etc.). The area is therefore representative of a high number of buildings, typical of Bologna's historical urban area. In the context of the square, six typical buildings were selected to conduct surveys and to apply the expeditious assessment methodol-

FIGURE 6 - (a) Location in the city of Bologna © Google Maps, (b) Urban re-design project, 1936 – 1941 © Historical Archive of the University of Bologna

FIGURE 7 - Palazzo Poggi elevation, laser scanner survey

ogy proposed within the project.

The surveys, a fundamental preliminary part for any type of analysis activity, were conducted in much greater depth than the methodology would have required. It was decided to investigate the selected buildings in depth to have more information to evaluate the results and the application of the ADRISEISMIC method. For this reason, two parallel investigations were carried out: the first, having a historical documentary nature, served to find plans, any technical documentation and information on structural interventions carried out in the past, and the second involved the physical measurement of the buildings by means of laser scanning and photogrammetry (Figure 7). No instrumental investigations were carried out to identify the mechanical characteristics of the materials, as the analyses were in any case aimed at an expeditious determination of the results.

The six buildings were first analysed and catalogued, then they were assessed using the ADRISEISMIC method. Table 1 highlights the main data considered for each structure and the outcomes of the assessment procedure, in terms of structural response index, seismic risk and most likely collapse mechanism.

TABLE 1 - Main building of Piazza Puntoni characteristics and assessment results

University Library 	Building characteristics			
	Presumed year of construction	Type Of Structure	Number of floors	Designated use
	XVI-XVII century	Load bearing masonry	3	Public (library)
	Adriseismic method results			
	Index of structural response (Value)	Seismic Risk	Main Collapse Mechanism	
	II (0.28)	High	Horizontal bending	
University student house and canteen 	Building characteristics			
	Presumed year of construction	Type Of Structure	Number of floors	Designated use
	1955	Reinforced concrete	6	Public (canteen)
	Adriseismic method results			
	Index of structural response (Value)	Seismic Risk	Main Collapse Mechanism	
	II (0.32)	Medium	Soft storey mechanism	

TABLE 1 (continued)

Department of Economics 	**Building characteristics**			
	Presumed year of construction	**Type Of Structure**	**Number of floors**	**Designated use**
	1925	Load bearing masonry	2	Public (classrooms)
	Adriseismic method results			
	Index of structural response (Value)	**Seismic Risk**	**Main Collapse Mechanism**	
	V (0.71)	Low	Ultimate strength in vertical elements	
Ancient residential buildings 	**Building characteristics**			
	Presumed year of construction	**Type Of Structure**	**Number of floors**	**Designated use**
	XIII-XVI century	Load bearing masonry	4	Residential
	Adriseismic method results			
	Index of structural response (Value)	**Seismic Risk**	**Main Collapse Mechanism**	
	II (0.35)	Medium	Cantonal overturning	

TABLE 1 (continued)

Superintendence, Fine Arts Academy and National Gallery 	**Building characteristics**			
	Presumed year of construction	**Type Of Structure**	**Number of floors**	**Designated use**
	1728-1735	Load bearing masonry	5	Public (museum)
	Adriseismic method results			
	Index of structural response (Value)	**Seismic Risk**	**Main Collapse Mechanism**	
	III (0.40)	Medium	Simple masonry overturning	
Sundial building 	**Building characteristics**			
	Presumed year of construction	**Type Of Structure**	**Number of floors**	**Designated use**
	1934	Load bearing masonry	5	Residential
	Adriseismic method results			
	Index of structural response (Value)	**Seismic Risk**	**Main Collapse Mechanism**	
	III (0.49)	Medium	Vertical deflection	

The method shows that the buildings have a low structural response index with a majority of category 'II', which is associated with a high risk for those buildings with public functions. The Department of Economics, which dates back to the 1920s and which was previously subject of structural, displays low seismic vulnerability, showing the best results compared to the six units analysed.

Croatian Pilot case: Podvorje square, Kaštela

The square under study is located in Kaštel Sućurac (Figure 8), in the administrative part of the town of Kaštela. Specifically, the area is located within the walls that perimeter the most historical part of the settlement. As in the Italian case, the particular shape of the square is a direct consequence of many transformations that have taken place over the centuries, starting with the invasions at the end of the 14th century.

Currently, the space is accessible by both pedestrians and vehicles, thus resulting in high seismic exposure. The human presence in the area is also increased by some public functions, such as the Museum of the City of Kastela, which


a

b

FIGURE 8 - (a) Location in Kaštel Sućurac © Google Maps; (b) Kaštel Sućurac at the end of 16th century © Archivio di Stato Venezia.

is housed in the archbishop's palace.

The buildings chosen as case studies cover a wide time span, characterised by construction techniques ranging from the 14th century, when the defensive castle was built, to a recent period, as evidenced by some private buildings.

Five structural units were analysed, two with public functions and three with private functions. The floors and roofs were almost always found to have a wooden load-bearing structure, while the vertical masonry elements consisted of either dressed regular stone or brickwork with lime mortar. In both cases, the facings showed good construction quality.

The surveys made it possible both to reconstruct the history of the square and to identify the main construction characteristics of the buildings, including the planimetric distribution aspects. From a dimensional point of view, aerial photogrammetry scans of the buildings were carried out using drones, and laser scanning campaigns through the positioning of 39 survey positions. This allowed the digitisation of the façades of all the buildings analysed in the project. An example of the processed point clouds is shown in Figure 9.

Table 2 shows the main characteristics of the buildings studied and the results obtained using the expeditious ADRISEISMIC method.

The buildings show a similar seismic response: the struc-

FIGURE 9 - Photogrammetric analysis of the archbishop's palace

tural response index is between category III and category IV. Similarly, the seismic risk results from the analyses as "medium" for all the buildings. This shows a non-negligible seismic capacity for dated buildings, although they are far from adequate with respect to design actions.

TABLE 2 - Main building of Podvorje square characteristics and assessment results

Residential building 1 	**Building characteristics**			
	Presumed year of construction	**Type Of Structure**	**Number of floors**	**Designated use**
	1921-1945	Load bearing masonry	3	Residential
	Adriseismic method results			
	Index of structural response (Value)	**Seismic Risk**	**Main Collapse Mechanism**	
	IV (0.59)	Medium	Cantonal overturning	
Public building 	**Building characteristics**			
	Presumed year of construction	**Type Of Structure**	**Number of floors**	**Designated use**
	1921-1945	Load bearing masonry	3	Public
	Adriseismic method results			
	Index of structural response (Value)	**Seismic Risk**	**Main Collapse Mechanism**	
	III (0.52)	Medium	Cantonal overturning	

TABLE 2 (continued)

<table>
<tr><td rowspan="6">Residential building 2
  </td><td colspan="4">Building characteristics</td></tr>
<tr><td>Presumed year of construction</td><td>Type Of Structure</td><td>Number of floors</td><td>Designated use</td></tr>
<tr><td>XX century</td><td>Load bearing masonry</td><td>3</td><td>Residential</td></tr>
<tr><td colspan="4">Adriseismic method results</td></tr>
<tr><td>Index of structural response (Value)</td><td>Seismic Risk</td><td colspan="2">Main Collapse Mechanism</td></tr>
<tr><td>III (0.53)</td><td>Medium</td><td colspan="2">Cantonal overturning</td></tr>
<tr><td rowspan="6">Residential building 3
  </td><td colspan="4">Building characteristics</td></tr>
<tr><td>Presumed year of construction</td><td>Type Of Structure</td><td>Number of floors</td><td>Designated use</td></tr>
<tr><td>XX century</td><td>Load bearing masonry</td><td>3</td><td>Residential</td></tr>
<tr><td colspan="4">Adriseismic method results</td></tr>
<tr><td>Index of structural response (Value)</td><td>Seismic Risk</td><td colspan="2">Main Collapse Mechanism</td></tr>
<tr><td>IV (0.64)</td><td>Medium</td><td colspan="2">Cantonal overturning</td></tr>
</table>

TABLE 2 (continued)

Archbishop' s palace				
	**Building characteristics**			
	Presumed year of construction	**Type Of Structure**	**Number of floors**	**Designated use**
	XV century	Load bearing masonry	2	Public (museum)
	Adriseismic method results			
	Index of structural response (Value)	**Seismic Risk**	**Main Collapse Mechanism**	
	III (0.44)	Medium	Horizontal bending	

Greek Pilot case: Sohora square, Rethymno

Sohora square is located in the most western part of the historical centre of Rethymno, a town located on the northern part of the island of Crete (Figure 10). The square is rather recent, built around the middle of the 18th century; it is much later to the Venetian domination that lasted for more than four centuries and left many architectural testimonies spread throughout the urban centre.

The buildings facing Sohora square are a representative sample of the city's-built environment: they have alternating concrete or masonry load-bearing structures and combine multiple construction techniques dating back to different periods distributed over approximately four centuries. The space, accessible to both vehicles and pedestrians, is used for both public and private functions, leading to a good variability also in seismic exposure.

Five buildings were considered in the Pilot case: the headquarters of the region of Crete, private residential buildings, two hotels and the local police station.

As in the case of the other squares, extensive documentary surveys and direct on-site measurements were conducted. Of the headquarters of the region, executive plans and construction details were found, as structural improvement

FIGURE 10 - (a) Location in Rethymno © Google Maps; (b) historical photograph of the square (source: ADRISEISMIC DT.2.2.1 - Report on the 3 pilot actions)

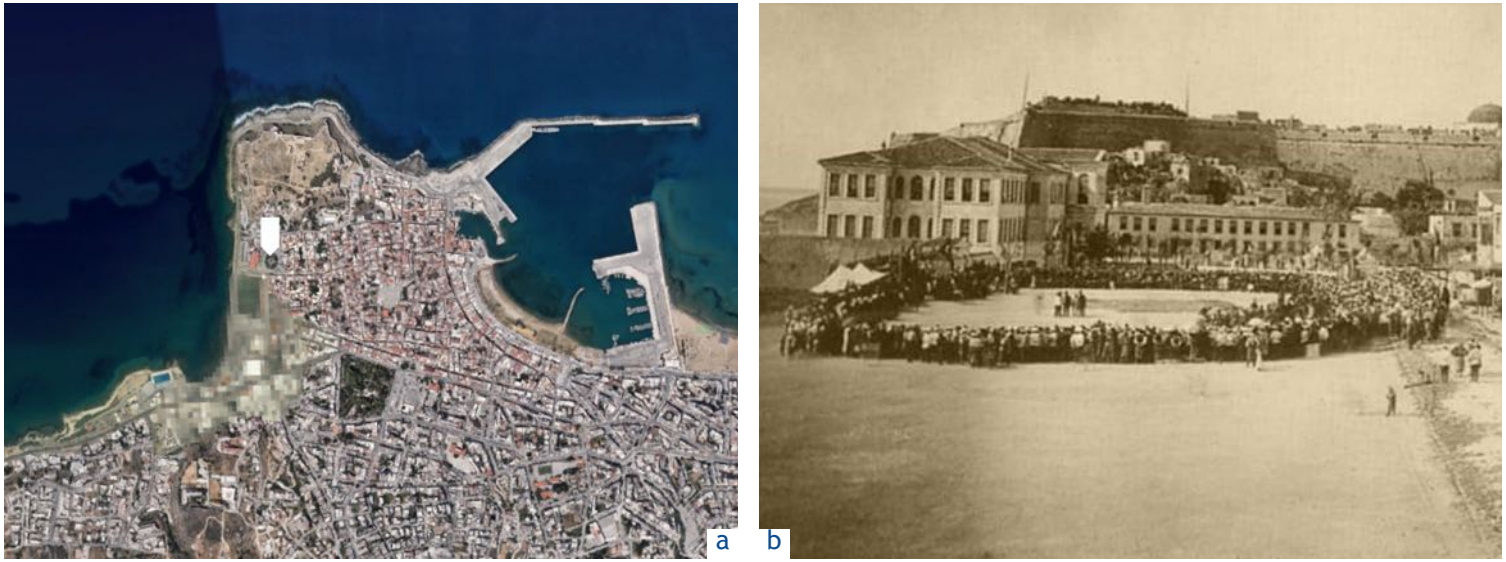


FIGURE 11 - Photogrammetric analysis of the Region Headquarters

works are in progress. For all other buildings, cadastral plans were found (with the exception of the police for security reasons) and photogrammetric scans were carried out (Figure 11).

As with the previous Pilot cases, Table 3 shows the main characteristics of the buildings studied and the results obtained using the expeditious ADRISEISMIC method.

The buildings show a wide range of results in terms of both structural response index and seismic risk. It ranges from a minimum of I, for the local police headquarters, to a maximum of V, for the most recently built hotel. The risk categories measured are 'medium' for private or public buildings with low vulnerability, 'high' or 'very high' in all other cases. The high categories are strongly influenced by the base acceleration, which is the highest of the three areas considered.

TABLE 3 - Main building of Sohora square characteristics and assessment results

Hotel stone building	Building characteristics			
	**Presumed year of construction**	**Type Of Structure**	**Number of floors**	**Designated use**
	XVI-XIX century	Load bearing masonry	2	Commercial
	Adriseismic method results			
	Index of structural response (Value)	**Seismic Risk**	**Main Collapse Mechanism**	
	III (0.42)	High	Masonry disintegration	

TABLE 3 (continued)

<table>
<tr><td rowspan="6">Region of Crete, Rethymnon Department Headquarters
  </td><td colspan="4">Building characteristics</td></tr>
<tr><td>Presumed year of construction</td><td>Type Of Structure</td><td>Number of floors</td><td>Designated use</td></tr>
<tr><td>1844-1847</td><td>Load bearing masonry</td><td>3</td><td>Public</td></tr>
<tr><td colspan="4">Adriseismic method results</td></tr>
<tr><td>Index of structural response (Value)</td><td>Seismic Risk</td><td colspan="2">Main Collapse Mechanism</td></tr>
<tr><td>II (0.37)</td><td>High</td><td colspan="2">Cantonal overturning</td></tr>
<tr><td rowspan="6">Police headquarters
  </td><td colspan="4">Building characteristics</td></tr>
<tr><td>Presumed year of construction</td><td>Type Of Structure</td><td>Number of floors</td><td>Designated use</td></tr>
<tr><td>XIX</td><td>Load bearing masonry</td><td>2</td><td>Public</td></tr>
<tr><td colspan="4">Adriseismic method results</td></tr>
<tr><td>Index of structural response (Value)</td><td>Seismic Risk</td><td colspan="2">Main Collapse Mechanism</td></tr>
<tr><td>I (0.19)</td><td>Very High</td><td colspan="2">Masonry disintegration</td></tr>
</table>

TABLE 3 (continued)

Minor private buildings 	**Building characteristics**			
	Presumed year of construction	**Type Of Structure**	**Number of floors**	**Designated use**
	XX	Reinforced concrete	2	Residential
	Adriseismic method results			
	Index of structural response (Value)	**Seismic Risk**	**Main Collapse Mechanism**	
	III (0.41)	Medium	Ductile column failure	
Hotel concrete building 	**Building characteristics**			
	Presumed year of construction	**Type Of Structure**	**Number of floors**	**Designated use**
	2000	Reinforced concrete	3	Commercial
	Adriseismic method results			
	Index of structural response (Value)	**Seismic Risk**	**Main Collapse Mechanism**	
	V (0.76)	Medium	Ductile column failure	

Comparison of results

The analyses made it possible to determine the vulnerability and seismic risk for the buildings facing the three squares, and consequently it was possible to compare the results. As shown in Figure 12, a good general distribution of the structural response index categories can be noted. The pilot action in Bologna has the widest range, with category III being the most populated (2 cases); no buildings belong to categories IV and VI. Podvorje square has a high density of buildings with a index of structural response of III (3 cases); categories I, II, V and VI are not populated. Sohora square shows as many as 3 buildings assigned class II and 2 in category III. There is only one case in category V.

The results for seismic risk categories are similarly reported in Figure 13. The majority of buildings fall into the 'Medium' category, 64% of the total, followed by 'High' 17%. With respect to vulnerability, there is less variability, with an overall medium to high risk. These data are in line with expectations, in fact the chosen areas present relevant criticalities (high hazard and exposure), highlighted when applying the method.

FIGURE 12 - Index of structural response per number of buildings on the case studies of (a) Piazza Puntoni (b) Podvorje square (c) Sohora square

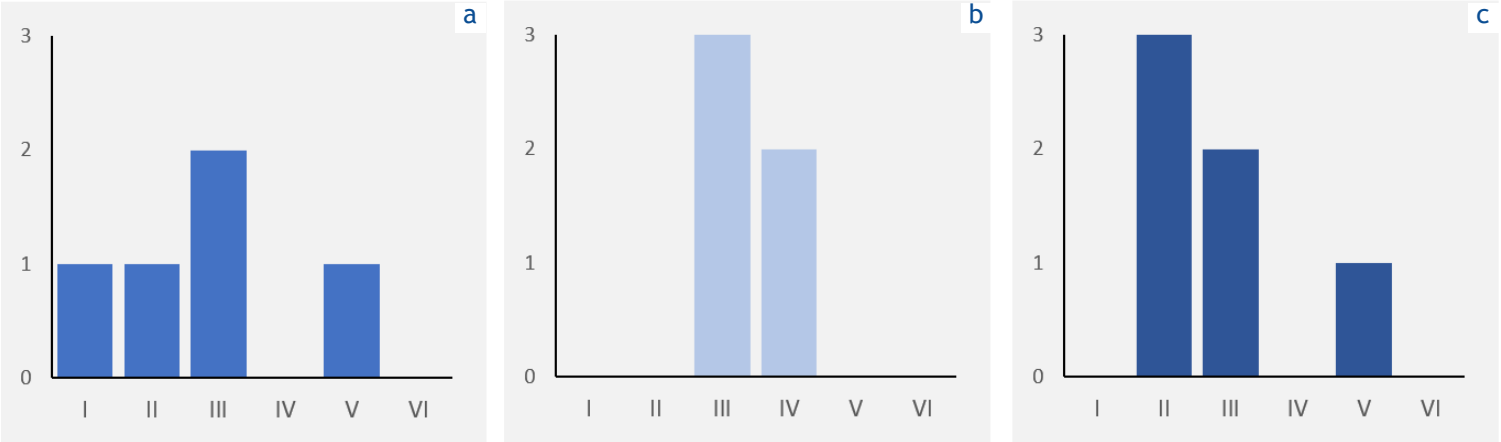
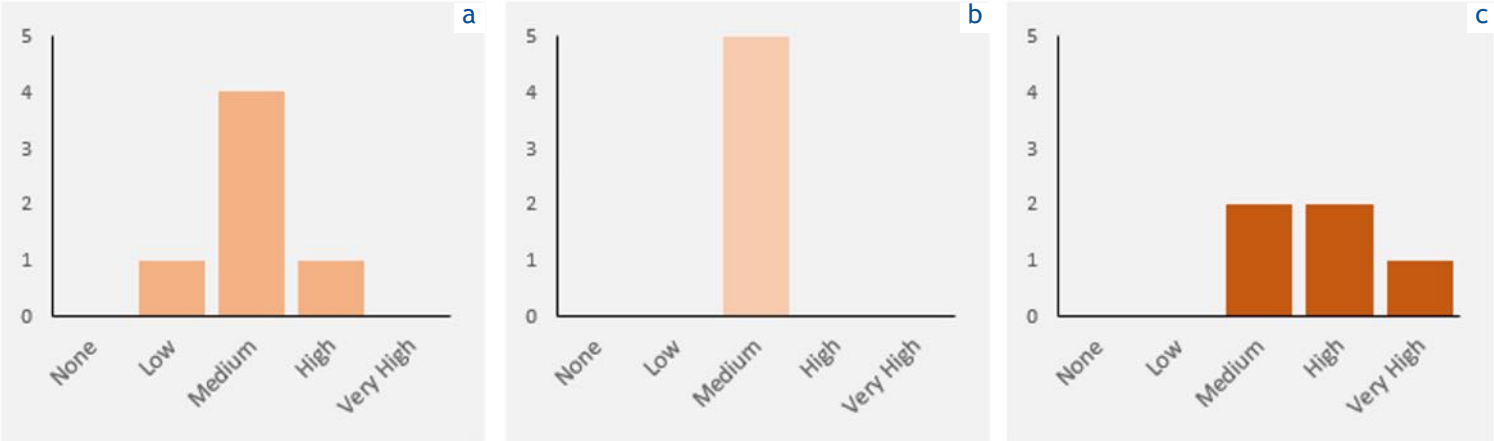


FIGURE 13 - seismic risk categories (a) Piazza Puntoni (b) Podvorje square (c) Sohora square



Endorsing ADRISEISMIC results: from strategic Roadmaps to Action Plans

Besides the development of the ADRISEISMIC expeditious assessment methodology, the partnership focused on the harmonisation of the regulative, operational and economic-financial background, aiming at establishing a common reference framework for seismic vulnerability and its reduction. The aim was to develop a shared approach to face seismic risk, in order to plan interventions for vulnerability reduction based on the same reference standards. The final goal of this activity was to ensure a higher safety and quality of the living environment, reducing risks for people and the environment.

A first step towards this objective has been the collection and consequent analysis of the main documents and initiatives in force in project partners' Countries related to seismic vulnerability reduction. Six categories (Figure 14) have been identified for the survey, according to which results have been clustered.

The collection resulted of 88 documents, the majority coming from Italy and Greece. It allowed the partnership to have an overview of current national and/or local planning and regulatory instruments and approaches to seismic norms and incentives, seismic vulnerability standards as well as related financial and economic incentives in each involved Partner State.

After an in-depth review of the collected documents, good practices have been identified in each category, intended as virtuous initiatives or inspiring norms and practices that could be replicated and transferred to other territorial context. Good practices consisted in the excellence of some regulative frameworks concerning the recovery of many urban centres damaged after seismic events, notable urban planning tools and regulations, as well as the restoration plans of the historical centres and inspiring seismic incentives.

FIGURE 14 - The six cathegories of the highlighted Good Practices (GPs)

Seismic Norms

This category was dedicated to collecting all regulations and other existing documentation dealing with the design of new structures and assessment of existing ones, taking into account their seismic resistance. Seismic norms are a type of building documents designed to protect property and life in buildings in the event of an earthquake. Seismic norms were created and developed in response to earthquakes that occurred in the past and caused enormous damage, especially to densely populated urban centers. Often, seismic norms are thus based on knowledge acquired after earthquakes as well as on laboratory and field research studies. While the goal of such norms is usually to prevent the collapse of buildings and thus casualties, there is an increasing tendency for buildings to be designed to remain usable even after the strongest expected earthquake.

Building Regulations

In this category, all the documents providing general rules and building codes for the construction of new buildings have been collected, together with the procedures that can be applied to the transformation of the existing building stock. Today building regulation represents an opportunity for local governments to conduct significant improvements in the application of measures to intervene on existing buildings. Building regulations have indeed recently been addressed at encouraging urban regeneration practices, also including the regulative framework for the application of incentives in case of adoption of seismic reduction interventions. Dealing with a set of rules to be followed when intervening on buildings, this category is the most punctual one when it comes to the definition of the possible interventions on the built environment, mostly referred to the building scale. The collection of this type of documents in the framework of ADRISEISMIC project is considered relevant to establish which building rules and codes are in force in the different countries involved in the project and to investigate how seismic vulnerability reduction is addressed, especially when it comes to historical buildings in historical areas.

Urban Planning Regulations

The urban planning regulation category includes those laws, policy and planning instruments in force to manage the sustainable development and regeneration of urban areas. In the last decades disaster risk reduction has become increasingly important and spatial planning is considered as one of the most important instruments to reduce the vulnerability of the built environment to natural hazards, to turn cities into more resilient environments. Indeed, targeted development strategies in urban plans can reduce the exposure of the involved assets to the risk and, consequently, their vulnerability to earthquake effects. Under the umbrella of urban planning regulation category, both national and regional laws in force in the six project partner countries have been collected, according to the most appropriate territorial scale of the planning instruments that varies from country to country.

Seismic Incentive Frameworks

Economic-related barriers are among the most frequent impediments inhibiting seismic retrofitting interventions. In this framework, economic and volumetric incentives represent an important instrument to increase the diffusion of seismic vulnerability reduction interventions, especially if combined with informative campaigns aimed at raising awareness towards seismic risk. In addition to financial and economic incentives that directly contribute to reducing the seismic vulnerability of the built environment, incentives that indirectly contribute to this goal can be considered (e.g., various publicly funded projects and their results, instructions, manuals, tools, applications, etc.). Such documents primarily help to raise people's awareness about the seismic vulnerability of the built environment. In order to distinguish between the so-called direct and indirect incentives, financial and economic incentives and raising awareness campaigns have been introduced.

Post-Earthquake Planning

This category covers all the activities related to the optimization of the seismic response and, at the same time, it supports the awareness of various stakeholders about possible scenarios in the event of an earthquake. Disaster preparedness consists of a set of measures undertaken by governments, organisations, communities or individuals to better respond and cope with the immediate aftermath of a disaster, whether it be man-made or caused by natural hazards. Many documents among this topic represent plans for how to react in the event of a natural / human / technology-caused event, where each type of disaster is discussed in more detail, including the response to a natural disaster - an earthquake. Also, various educational programs that contain information on a better response to earthquakes have been included. A special place in this category is represented by various protection and rescue plans and documents of seismic risk assessments. There are also various tools (e.g., applications, simulations) to help raise awareness about seismic hazard, with the help of which it is possible to learn about the seismic vulnerability of a particular building. In addition to the above, this category also includes other norms and incentives addressing awareness and response in the event of an earthquake.

Insurance Against Earthquakes

Insurance against earthquakes is a form of property insurance that pays a property holder in the event of an earthquake that causes damage to the property. In the past, earthquake loss was assessed using a collection of mass inventory data and was based mostly on experts' opinions. Today it is estimated using a Damage Ratio (DR), a ratio of the earthquake damage money amount to the total value of a building. Earthquake insurance can cover damage to a home, personal belongings, and some other expenses in a case that earthquake happens. The topic does not directly contribute to the reduction of seismic vulnerability, but it contributes to the financial capacity to reduce the seismic vulnerability of the buildings and the urban environment.

TABLE 4 - Summary of the highlighted Good Practices (GPs) and reference country

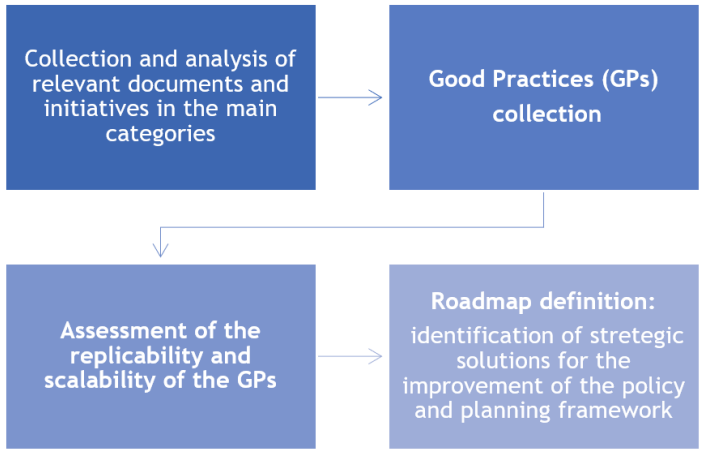
TOPIC	No. GP	NAME OF THE HIGHLIGHTED GP	PP COUNTRY
Seismic Norms	GP1	Eurocode 8: Design of structures for earthquake resistance EN 1998 (2004) + National Annexes	all PPs
	GP2	Manual - Techniques of repair and reinforcement of masonry buildings	Croatia
	GP3	Application of retrofitting and intervention techniques - KANEPE 2017	Greece
	GP4	Guidelines for assessment and structural interventions on masonry buildings	Greece
	GP5	Evaluation and reduction of seismic risk for cultural heritage	Italy
	GP6	Regional norms for the reduction of seismic risk	Italy
	GP7	List of interventions without relevance for public safety and non-substantial variants	Italy
Urban Planning Regulation	GP8	Geological suitability studies of Rocks - Ministries' decision 37691/2007 for the implementation of General Town plans	Greece
	GP9a	Analysis of the local seismic risk as part of the Urban Plan Baseline Framework	Italy
	GP9b	Emergency limit condition (CLE) part of the Urban Plan Baseline Framework	Italy
	GP9c	Seismic Microzonation (MS) foreseen in the Urban Planning Baseline Framework	Italy
Seismic Incentive Framework	GP10	Framework for pre-earthquake monitoring of public utility buildings	Greece
	GP11	Sismabonus - national incentives for seismic retrofit of buildings	Italy
	GP12	Guidelines for the evaluation of seismic vulnerability of buildings	Italy
	GP13	“I don’t take risks” - national awareness campaign for risk prevention and preparedness	Italy
	GP14	Volumetric incentives for seismic retrofitting interventions	Italy
	GP15	“EDURISK” - increasing knowledge and awareness of seismic risk in schools	Italy
	GP16	“Secure +” - online tool to raise awareness on seismic risk of Italian municipalities	Italy
	GP17	POTROG applications (apps. regarding seismic assessment of buildings, earthquake scenarios...)	Slovenia
Post-Earth-quake Planning	GP18	General Civil Protection Plan concerning earthquakes 1st edition, code name Engelados	Greece
	GP19	Guidelines for planning and execution of civil protection drills (2nd edition)	Greece
	GP20	National seismic risk rescue program	Italy
	GP21	Resolution on the National Program for Protection against Natural and Other Disasters 2016-2022	Slovenia

The process led to the identification of 21 Good Practices (Table 4), the majority of which belonging to the seismic incentive category.

In a second stage, each partner has rated the potential of replicability of the selected good practices in its own Country, assessing the most suitable territorial scale of implementation, together with potential barriers.

All the above-mentioned activities have generated knowledge at project level. A first step to tailor the general knowledge to the various local context is represented by the **ADRISEISMIC roadmaps** (Figure 15). These are strategic documents consisting of a step-by-step procedure aiming at improving the seismic norms, urban planning laws, building regulations, post-earthquake planning documents and procedures, incentives and insurance framework in respect to seismic vulnerability of the built environment and historical centres. Each country involved in the project has drafted its own roadmap, besides the institutional role of the representing partners (e.g. public authorities, higher education, private companies) aiming at identifying a strategic pathway to increase its resilience towards the seismic risk.

FIGURE 15 - Main steps for the definition of the ADRISEISMIC roadmaps



This exercise allowed to help local decision-makers and stakeholders in assessing the current status of norms and methods in force to tackle the reduction of the seismic vulnerability, but also to inform them about the possibilities to adopt good practices already tested and verified, and assisting them in the implementation and monitoring phases.

The ADRISEISMIC roadmap consists of a ready-to-use tool divided in 5 steps (Figure 16):

1. Identification of the gaps in the policy and planning framework,
2. Identification of barriers that prevent the improvement of the policy framework,
3. Identification of the solutions to improve the resilience,
4. Identification of possible entities, stakeholders and funds,
5. Selection of the monitoring strategies.

The five steps are organized in turn into six sub-levels, representing the six above mentioned topics of investigation.

The document collected and the replicability and scalability analysis are the input for the identification of the gaps

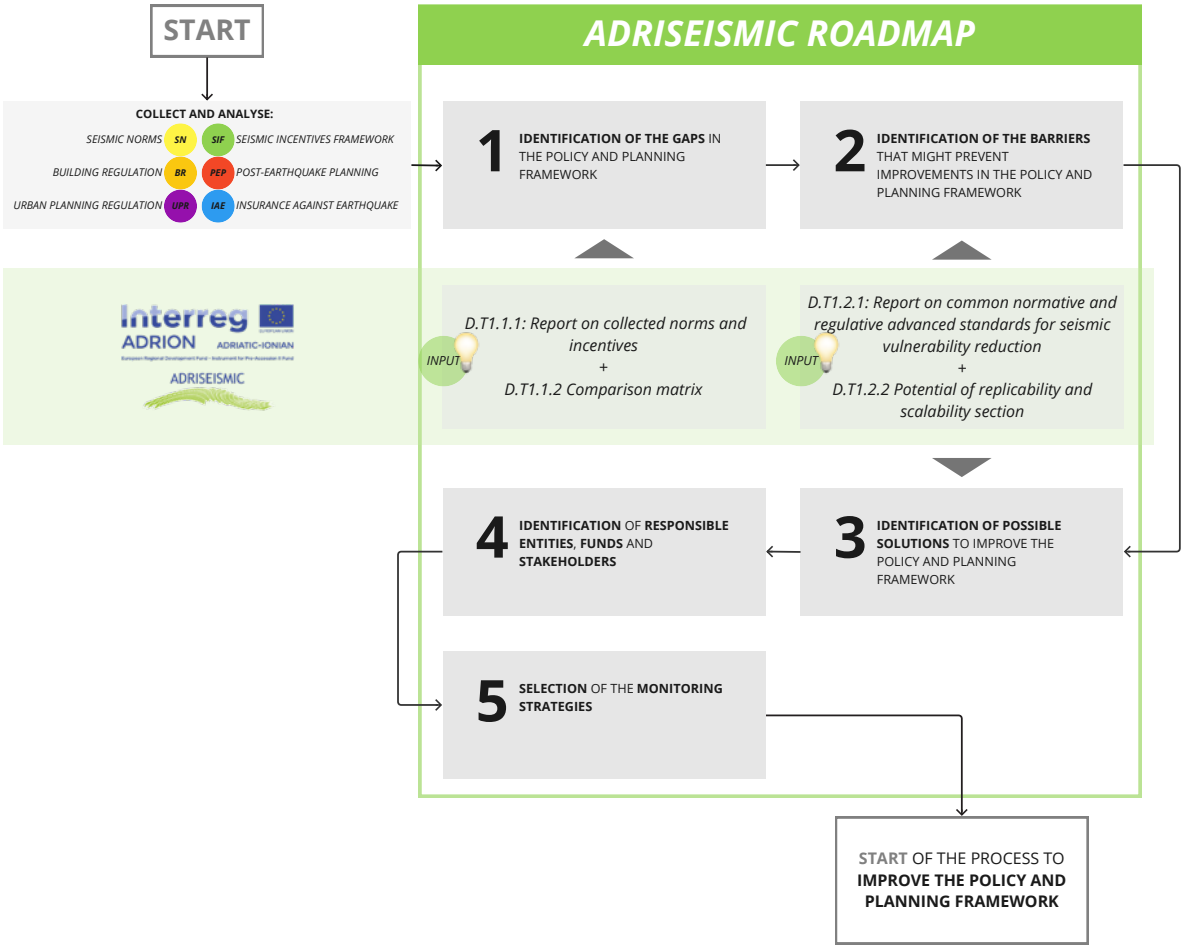


FIGURE 16 - ADRISEISMIC roadmap simplified flowchart

in the planning and regulative framework and for the analysis of the barriers for the improvement. The repository of the 21 good practices represents possible solutions that can be adopted to increase the resilience towards seismic risk. The selection of some of the good practices constitutes the strategic pathway specific for each project partner country. Finally, the last steps of the roadmap provide information about possible stakeholders, funds and monitoring strategies increasing the concreteness and feasibility of the identified actions.

The six roadmaps have been validated through the local workshops and represent the picture of the current policy and planning framework situation in Albania, Italy, Croatia, Greece, Serbia and Slovenia.

A further step has been then undertaken by local and regional authorities involved in the consortium that committed to embed it in their policy instruments some of the project results, establishing priorities among the possible actions and based on the specific territorial needs. To this aim, the Municipality of Gjirokaster and the City of Kaštela developed a local action plan, while the Region of Crete and the RDA Bačka are responsible for the action plan at regional scale.

Action Plans represent instruments for public authorities to clearly define and explain the way to integrate and adapt some of the promising good practices and/or the new expeditious seismic vulnerability assessment methodology into the current local practices, thus enhancing their replicability and scalability in the Countries involved in the project but also beyond. The structure of the action plans reflects a process to be followed by municipalities and regions in order to identify priorities among all the possible strategies identified at project level to increase the resilience of the historical areas and provide as much details as possible in this regard. In this way it is possible to verify the effective concreteness and feasibility of the actions selected by the authorities in charge of the implementation. The methodology also foresees a series of local workshops to involve key stakeholders to take decisions on what to insert in the action plan.

The process starts from the identification of the territorial context and the specific needs of the region/municipality, followed by the presentation of the overall and specific objectives of the plan. A specific chapter has been then dedicated to the identification of the key stakeholders that were involved in the above-mentioned workshops and their specific role in the process. The last part of the document is about the description of the specific actions identified as priority to improve resilience of historical areas while reducing the vulnerability of the existing assets, together with the timeframe of implementation and the identification of possible risks and the corresponding mitigation actions to undertake. Each measure is described in detail, starting from the identification of specific objectives and specific activities foreseen for the implementation, the timeframe, main stakeholders to involve and beneficiaries of the action. Attention is also paid to the means for monitoring of the implementation phase.

City of Kaštela Action Plan

By applying the methodology, after the presentation of the territorial context, the needs of the city of Kaštela have been presented. On one hand, the need for broaden the knowledge about the features of cultural heritage is stressed, aiming at obtaining data about the status of structural elements and the exposure to seismic risk. On the other hand, it is envisaged that preventive actions are spread but on a very small scale, and the knowledge possessed by professionals and cultural heritage managers involved in protection is currently not sufficient. Starting from this baseline framework, the overall objective of the plan is to incorporate principles of pro-active reduction of seismic risks through decentralized and empowered disaster management institutions at the local level and through adoption of a multi-sectoral approach to disaster management. The local action plan will serve as a guide to stimulate the exchange of ideas and knowledge on the assessment and reduction of the seismic vulnerability of the historic urban centres of the City of Kaštela.

Five actions have been included as priorities for the city (Tables 5-9).

FIGURE 17 - (a,b) City of Kaštela.

a

b

TABLE 5 - Action no.1 of the City of Kaštela Action Plan

Action no. 1	Seismic vulnerability maps
Specific objective of the action	The specific objective of the action is to increase seismic resistance of historic buildings, i.e. to enhance the protection and preservation of the most critical points within historic urban centers of the City of Kaštela in case of an earthquake.
Brief description of the action	The action presumes drawing-up the seismic vulnerability maps for the whole area of the City of Kaštela which will assist rescue units in identifying the most critical points in need. Mapping presumes a complex process which includes several steps to be fulfilled in order to be able to comprise structural, social and physical indicators of seismic vulnerability of a particular site. Thus, in developing seismic vulnerability maps the following main steps will be undertaken. The first step is to build the knowledge on geometrical, material and structural characteristics of the buildings in the area of the City of Kaštela by collecting the necessary data. After collecting necessary data, the next step is built around analysis of consequences of the earthquake in terms of seismic damage and seismic risk to the City of Kaštela for three seismic scenarios, i.e. three levels of earthquake: 95 years for the most probable adverse event (weaker earthquake), 225 years for the earthquake of medium intensity, and 475 years for the event with the worst possible consequences (stronger earthquake). The influence of local soil conditions will be taken in account as well. Following that, the third step includes assessment of seismic vulnerability of the buildings by vulnerability index method. The main issue in determining the seismic vulnerability is having a comprehensive view to all probable damages related to earthquake occurrence. Therefore, the final step in mapping will be to assess adverse consequences following the methodology and procedure which ultimately result in demonstration of seismic vulnerability and seismic risk by means of seismic vulnerability index maps and damage index and risk maps.
Specific activities foreseen for the implementation of the action	Performing risk assessment – field scanning (data collection (investigation of historical and archival documentation; detail survey of geometrical characteristics, architectural measurements and creation of architectural drawings; identification of structural systems and materials by visual inspection, using archive documentation, literature and thermographic imaging; characterization of the soil type by geophysical survey), seismic scenarios, seismic vulnerability assessment (filling in a survey form data on 11 geometrical and structural vulnerability parameters (such as floors above the ground, wall thickness, irregularities in height, inter-floor height, stiffening wall distance, expected ductility), calculation of those parameters and calculation of vulnerability index for the building), assessment of adverse consequences

Reference to the policy instruments collected in the framework of the project	Seismic norms: Eurocode 8 Building regulations: The Construction Act Seismic incentive framework: Protection and rescue plan for the territory of the Republic of Croatia; Manual for earthquake restoration of existing masonry buildings; Techniques of repair and reinforcement of masonry buildings
Reference to the Good Practice	Framework for pre-earthquake monitoring of public utility buildings (GP14) – developed for cultural buildings as well Analysis of the local seismic risk as part of the Urban Plan Baseline Framework (GP9a)
Implementation timeframe	June 2023 - June 2025
Means for monitoring the implementation	Presenting the field scanning results to the stakeholders through organized lectures/workshops
Main stakeholders involved and their roles and contribution	The City of Kaštela - coordination and monitoring of the progress Public institution RERA S.D. for the coordination and development of the Split-Dalmatia County - coordination University of Split, Faculty of Civil Engineering, Architecture and Geodesy - implementation of the action, evaluation and presentation of results Conservation department in Trogir - cooperation in implementation of the action with the Faculty, expert support Kvinar d.o.o. - expert support Insurance company - expert support
Beneficiaries	Rescue units, cultural heritage managers, entire community of the City of Kaštela
Indicative funding sources	The Recovery and Resilience Facility, This European Territorial Cooperation (Interreg), Multiannual Financial Framework

TABLE 6 - Action no.2 of the City of Kaštela Action Plan

Action no. 2	Construction typology database
Specific objective of the action	The specific objective of the action is to enhance the implementation of the earthquake protection measures through reformation, renovation and structural reinforcement of the masonry building structures.
Brief description of the action	The division of a building stock into distinct classes of construction typologies and hence the definition of a thorough building classification scheme is a major prerequisite for any vulnerability or loss assessment study. The action involves enrichment and systematization of the database on construction typology to ensure a reliable coverage of the key parameters and, accordingly, higher level of implementation of the earthquake protection measures. The categorization of buildings into distinct typology classes has become a major task for any earthquake loss estimation study. Construction typology database should help structural engineers, architects and urban planners to understand a building's behavior and response to seismic hazard as well as assist them in defining improvement techniques and long-term sustainable planning. An important part of this action are vulnerability curves that can be used to determine damage for a building with known vulnerability index and the certain intensity of seismic action represented with peak ground accelerations. Given the similar characteristics of the building construction in the entire City of Kaštela, where the centers of the settlements consist of stone buildings while the outside area is formed of buildings and family houses mostly built of blocks with horizontal and vertical circles, it will be possible to develop vulnerability curves and, thus, produce models that will enhance future evaluations of seismic risk levels and retrofitting interventions to both engineered and non-engineered masonry buildings. By providing systemized construction typology database this action is going to assist seismic performance assessments and identification of effective mitigation plans to improve resilience of building's construction in the City of Kaštela.
Specific activities foreseen for the implementation of the action	Updating existing database (in-situ based observation, result comparation, updating and adapting database) Digitization of the cultural heritage data (digital entry of all of the data) Development of vulnerability curves (engagement of external experts)
Reference to the policy instruments collected in the framework of the project	Seismic norms: Eurocode 8 Building regulations: The Construction Act Seismic incentive framework: Protection and rescue plan for the territory of the Republic of Croatia, Manual for earthquake restoration of existing masonry buildings, Techniques of repair and reinforcement of masonry buildings, Emergency seismic reconstruction program
Reference to the Good Practice	Guidelines for assessment and structural interventions on masonry buildings (GP4)
Implementation timeframe	January 2023 - December 2024
Means for monitoring the implementation	Informing about the made progress through information notices published on the official website of the City of Kaštela,
Main stakeholders involved and their roles and contribution	The City of Kaštela - coordination Public institution RERA S.D. for the coordination and development of the Split-Dalmatia County - coordination, systematization and outsourcing University of Split, Faculty of Civil Engineering, Architecture and Geodesy - expert support (development of vulnerability curves) Conservation department in Trogir - expert support
Beneficiaries	Rescue units, cultural heritage managers, entire community of the City of Kaštela
Indicative funding sources	The Recovery and Resilience Facility, This European Territorial Cooperation (Interreg), Multiannual Financial Framework

TABLE 7 - Action no.3 of the City of Kaštela Action Plan

Action no. 3	New governance model to ensure coordination in all disaster risk management phases
Specific objective of the action	The specific objective of the action is to establish multi-sectoral coordination system able to provide well-thought and swift response in the event of seismic activity.
Brief description of the action	The action presumes setting-up strong coordination mechanism between different bodies and institutions so as to, in the event of catastrophe, ensure uninterrupted, swift and reliable functioning of all relevant services and operation of public information system. Inter-organizational coordination is important factor for disaster coordination. Through this action it is intended to discover and identify clusters for collaboration as crucial factors to improve the disaster emergency and logistical systems. This will be achieved through series of meetings with relevant stakeholders. Furthermore, the result of this action is envisaged in a form of an integrated location-distribution model for coordinating logistic support and evacuation operations in seismic response operations. Logistics planning in case of a seismic hazard involves dispatching commodities (e.g., medical materials and personnel, specialised rescue equipment and rescue teams, food, etc.) to distribution centres in affected areas and evacuation and transfer of wounded people to emergency units. During the initial response time it is also necessary to set up temporary emergency centers and shelters in affected areas to speed up medical care for less heavily wounded survivors. Logistics coordination in case of an earthquake involves the selection of sites that result in maximum coverage of medical need in affected areas. Another important issue that arises in such emergencies is that medical personnel who are on duty in nearby hospitals have to be re-shutted to serve both temporary and permanent emergency units. Thus, an optimal medical personnel allocation must be determined among these units. Such multi-commodity network flow model will contribute to the traffic management system by producing detailed vehicle route able to respond adequately to changing traffic conditions across time. For this purpose, advancements made in the area of Intelligent Transport Systems (ITS) with regards to managing damaged traffic network will be consulted.
Specific activities foreseen for the implementation of the action	Performing risk assessment – field scanning (data collection (investigation of historical and archival documentation; detail survey of geometrical characteristics, architectural measurements and creation of architectural drawings; identification of structural systems and materials by visual inspection, using archive documentation, literature and thermographic imaging; characterization of the soil type by geophysical survey), seismic scenarios, seismic vulnerability assessment (filling in a survey form data on 11 geometrical and structural vulnerability parameters (such as floors above the ground, wall thickness, irregularities in height, inter-floor height, stiffening wall distance, expected ductility), calculation of those parameters and calculation of vulnerability index for the building), assessment of adverse consequences

Reference to the policy instruments collected in the framework of the project	Seismic norms: Eurocode 8 Building regulations: The Construction Act Seismic incentive framework: Protection and rescue plan for the territory of the Republic of Croatia; Manual for earthquake restoration of existing masonry buildings; Techniques of repair and reinforcement of masonry buildings
Reference to the Good Practice	Framework for pre-earthquake monitoring of public utility buildings (GP10) – developed for cultural buildings as well Analysis of the local seismic risk as part of the Urban Plan Baseline Framework (GP9a)
Implementation timeframe	June 2023 - June 2025
Means for monitoring the implementation	Presenting the field scanning results to the stakeholders through organized lectures/workshops
Main stakeholders involved and their roles and contribution	The City of Kaštela - coordination and monitoring of the progress Public institution RERA S.D. for the coordination and development of the Split-Dalmatia County - coordination University of Split, Faculty of Civil Engineering, Architecture and Geodesy - implementation of the action, evaluation and presentation of results Conservation department in Trogir - cooperation in implementation of the action with the Faculty, expert support Kvinar d.o.o. - expert support Insurance company - expert support
Beneficiaries	Rescue units, cultural heritage managers, entire community of the City of Kaštela
Indicative funding sources	The Recovery and Resilience Facility, This European Territorial Cooperation (Interreg), Multiannual Financial Framework

TABLE 8 - Action no.4 of the City of Kaštela Action Plan

Action no. 4	Strengthening public awareness
Specific objective of the action	The specific objective of the action is to raise public awareness and encourage participation of citizens in cultural heritage protection.
Brief description of the action	Within the scope of this action, specialized protection units will promote and organize preventive information and civil protection education for citizens and students from primary schools to the University level. These courses will aim to make aware individuals on the associated hazards and vulnerabilities, prepositioning the emergency supplies, making response plan and being able to cope with seismic disaster using locally available resources. In short, the courses will inform public on Do's and Don'ts before, during and after an earthquake. On top of that, the citizens will be introduced to the good seismic prevention practices that will, hopefully, stimulate their interest and initiative for similar actions. In general, vulnerability of historic urban centers call for a more specialized approach to increase resilience and preparedness for earthquake crisis. In this light, one aspect of this action is organization of the earthquake vulnerability tours. It is envisaged as a guided tour aiming to point out how vulnerable the City's buildings and critical facilities are to earthquakes. Selection of the route/location that is subject of the tour will be based on the visitor's interest, time and level of their knowledge. Further, the action will establish cooperation with local media for the purpose of disseminating earthquake awareness and preparedness message. One of the effective means of disseminating information of earthquake safety is publication. In that sense, materials on seismic awareness and preparedness, such as newsletters, manuals, posters, instruction leaflets etc., will be printed. Although this action is primarily focused on raising public awareness, it is also aimed at strengthening capacity of local services of the City of Kaštela through education and emergency exercises/training, especially those in civil engineering department, to understand local vulnerability and risk, earthquake prevention needs, preparedness and response capabilities. In capacity building process it is proposed to also include student population. The first step is to define which specialized area from the University are directly related to the subject (architecture, civil engineering, art history etc.) and to identify professors/experts who would mentor their activities. Through this mentoring process, the students will acquire specific knowledge about local situation and the basis for development of young experts will be created.
Specific activities foreseen for the implementation of the action	Organization of lectures, public presentations, workshops, seminars, expert consultations for citizens of the City of Kaštela Organization of the earthquake vulnerability tours (media campaign, collaboration with experts, expert guide) Publication of informative brochures, leaflets, manuals Online campaign (official website of the City, social networks) Educational workshops and seminars for city services staff (10 hours, guest lecturers from the Civil protection of the City of Kaštela, Conservation department in Trogir and other professionals) Organization of a student mentoring model and the dissemination of specific knowledge (10 hours, University of Split, guest lecturers from the Civil protection of the City of Kaštela, Conservation department in Trogir and other professionals)
Reference to the policy instruments collected in the framework of the project	Seismic incentive framework: Protection and rescue plan for the territory of the Republic of Croatia, Plan for the development of the civil protection system in the area of the City of Kaštela, Civil Protection System Act
Reference to the Good Practice	"EDURISK" - increasing knowledge and awareness of seismic risk in schools (GP15) "I don't take risks" - national awareness campaign for risk prevention and preparedness (GP13)
Implementation timeframe	June 2023 - June 2025
Means for monitoring the implementation	Informative reports on organized lectures, presentations, workshops Published brochures, leaflets and other informative material in digital and/or printed form
Main stakeholders involved and their roles and contribution	The City of Kaštela - coordination, representation, organization Public institution RERA S.D. for the coordination and development of the Split-Dalmatia County - coordination, organization, outsourcing Civil protection of the City of Kaštela - expert support (lectures, presentations, workshops, consultations, vulnerability tours) Museum of the City of Kaštela - expert support Croatian Mountain Rescue Service - expert support Red Cross Kaštela - staff support Volunteer Fire Departments - expert support Conservation department in Trogir - expert support
Beneficiaries	Entire community of the City of Kaštela
Indicative funding sources	This European Territorial Cooperation (Interreg), Multiannual Financial Framework

TABLE 9 - Action no.5 of the City of Kaštela Action Plan

Action no. 5	Development of training courses
Specific objective of the action	The specific objective of the action is to develop training courses to upgrade skills of the employees in cultural heritage institutions
Brief description of the action	This action will take decisive steps towards preserving cultural heritage from risk by implementing experts' knowledge in planning and decision-making process. In particular, the most important segment is the education of employees working in institutions related to the protection of cultural heritage. Since employees do not possess enough expertise, it will be enhanced through training courses in the field of heritage protection against numerous risks and their consequences. Also, all interested participants will be able to participate in these training courses, which will take the form of trainings, workshops and seminars. During the organization of these training courses, examples of good practice will be singled out, which will be used to form a model of organization of training courses. An important tool for education of the employees is the use of the MOODLE platform, which is one of the results of ADRISEISMIC project. Participants of the training courses will be informed on how to use the platform during the course and they will be encouraged to use it in their further professional life.
Specific activities foreseen for the implementation of the action	Organization of local training courses (at the level of a settlement) Organization of joint training courses (at the level of the City of Kaštela) Drawing-up a brochure with relevant contact details and hierarchy scheme Developing effective training course model
Reference to the policy instruments collected in the framework of the project	Seismic incentive framework: Techniques of repair and reinforcement of masonry buildings, Manual for earthquake restoration of existing masonry buildings
Reference to the Good Practice	Manual - Techniques of repair and reinforcement of masonry buildings (GP2) Application of retrofitting and intervention techniques - KANEPE 2017 (GP3)
Implementation timeframe	June 2023 - June 2025
Means for monitoring the implementation	Informative reports on organized seminars, workshops, courses Published brochure
Main stakeholders involved and their roles and contribution	The City of Kaštela - coordination, management and monitoring of the progress Public institution RERA S.D. for the coordination and development of the Split-Dalmatia County - coordination, management and logistic services Conservation department in Trogir - expert support Museum of the City of Kaštela - expert support Kvinar d.o.o. - expert support University of Split, Faculty of Civil Engineering, Architecture and Geodesy - expert support
Beneficiaries	Public institutions, cultural heritage managers, cultural heritage associations, community of the City of Kaštela
Indicative funding sources	Multiannual Financial Framework

Municipality of Gjirokaster Action Plan

In the local action plan of Gjirokaster municipality, the territorial context and needs have been presented. Gjirokaster is rich in cultural heritage and retrofitting interventions have not always been implemented according to the specificities of those kind of buildings. Knowing how to properly intervene is crucial to the maintenance of cultural heritage, especially for implementing its resistance towards seismic risk. Another issue to address is the lack of consistent information regarding the Historic buildings, like building typology, pathology (cracks, status) ownership details. The 2 Actions identified in the Action Plan aim to point out tailored actions that need to be undertaken in order to:

- Enhance the knowledge related to characteristic of historic buildings in Gjirokaster municipality, assessing the current conservation state and the construction techniques of Vulnerable Historic Buildings in the city of Gjirokaster with the aim to prioritize the buildings that need to be protected from earthquake events;
- Raise public awareness to citizens for seismic events and trigger key actors such as High Education Institutes, NGOs, Construction Companies, Local & Regional Authorities to collaborate for the protection of vulnerable buildings by sharing knowledge, experience, and collecting funds.

Two actions have been included as priorities for the city (Tables 10-11).

FIGURE 18 - (a,b) City of Gjirokaster. (a) © Diego Galli via Wikimedia Commons; (b) © Armin Flickr via Wikimedia Commons.

a

b

TABLE 10 - Action no.1 of the Municipality of Gjirokaster Action Plan

Action no. 1	Creation of a database of Endangered Historic Buildings (EHB)
Specific objective of the action	The action is aimed at identifying vulnerable historic buildings in old town of Gjirokaster, the current damages, their pathology and vulnerability towards seismic risk. The database will contribute to monitor the status of the buildings schedule maintenance works and enhance the protection from seismic events.
Brief description of the action	The database will consist of an online platform (dynamic database system), recording vulnerable historic buildings in old town of Gjirokaster (UNESCO Heritage Monument). The data of the system will be open (without copyrights), accessible to the public in two languages (Albanian and English). The platform will aim to provide essential information for the EHB of the old town about the structure, the building typology, features about load bearing, floors, façade, roof, non-bearing walls, ceilings and all the components of the buildings as well as data for their damages (e.g. type of cracks, % cracks, cracks on load bearing masonry).
Specific activities foreseen for the implementation of the action	Mapping of EHB of the old town, Development of an online platform, Insertion of data from Civil Engineers & Architects of the Municipality of Gjirokaster, Evaluation of pathology & Vulnerability Building Interventions / Renovations Monitoring & database update
Reference to the policy instruments collected in the framework of the project	Seismic incentive framework: Manual for earthquake restoration of existing masonry buildings, Techniques of repair and reinforcement of masonry buildings
Reference to the Good Practice	Evaluation and reduction of seismic risk for cultural heritage (GP5) Framework for pre-earthquake monitoring of public utility buildings (GP10)
Implementation timeframe	January 2024 - December 2027
Means for monitoring the implementation	Periodic review (once a year) of the uploaded data and validation of the information through the developed platform. The data will be uploaded and reviewed only by entrusted engineers (civil engineers & architects).
Main stakeholders involved and their roles and contribution	Higher Education Institutes (e.g. University of Tirana, Canadian Institute of Technology): Development of a sophisticated platform Municipality of Gjirokaster: The Urban Planning Directorate and the Directorate of Communal Service will provide civil engineers & architects for the inspection of the buildings, the collection of the essential data and the insertion of the data in the platform. Ministry of Culture: Review of the data through the platform and prioritize the renovation of the buildings. Technical Chamber of Albania: Provision of technical assistance for the collection and the review of the data through the platform.
Beneficiaries	Citizens, Owners of EHB, Municipal and Regional Authorities, Ministry of Culture and Tourism, cultural heritage associations, actors involved with tourism and cultural sector etc.
Indicative funding sources	Participation in relevant calls for projects' proposals and further explore of: EU Funds (Instrument for Pre-Accession Assistance, co-financing programs e.g., Interreg programs, Greece-Italy program, Balkan Med etc..), National Funds and Private Funds.

TABLE 11 - Action no.2 of the Municipality of Gjirokaster Action Plan

Action no. 2	Raise Public awareness & Create Synergies with key actors
Specific objective of the action	This action aims to raise public awareness to citizens and trigger key actors (High Education Institutes, NGOs, Construction Companies, Local & Regional Authorities) to collaborate for the protection of vulnerable buildings (share knowledge, experience, and funds). Furthermore, the activity foresees workshops and training seminars organized by the Municipal, Regional and National authorities to citizens and students (at schools) in order learn how to behave before, during and after a seismic event.
Brief description of the action	This activity has 2 different directions: Create synergies between key actors (High Education Institutes, NGOs, Construction Companies, LRA) sharing knowledge, experience, and funds for the protection of vulnerable buildings and draft guidelines for the maintenance and the projection of the cultural heritage of Gjirokaster. Education / training to citizens and students about potential risks, consequences, self-behavior for their protection during an earthquake and how to minimize potential pressures to historic and cultural monuments/buildings of the city. The training materials created and stored in the Moodle platform during ADRISEISMIC project will be further valorized for the purposes of this activity.
Specific activities foreseen for the implementation of the action	Organization of info-days/lecturers, including presentations for citizens (at public places) and students (at schools) for seismic events. Organization of a social media campaign, collaboration with experts, expert guide. Design of informative brochures, e-leaflet etc. Organization of technical meetings/consultations/word café with key actors and drafting guidelines (including key-outputs) for the projection of vulnerable buildings from seismic events.
Reference to the policy instruments collected in the framework of the project	Seismic incentive framework: Protection and rescue plan from earthquakes for Albania, Guidelines for the development of the civil protection system in the city of Gjirokaster
Reference to the Good Practice	National seismic risk rescue program (GP20)
Implementation timeframe	January 2023 - December 2024
Means for monitoring the implementation	Valorise produced training courses in ADRISEISMIC project through Moodle platform. Elaboration of informative reports on organized lectures, presentations, workshops. Publish brochures, leaflets and other informative material in digital and/or printed form.
Main stakeholders involved and their roles and contribution	The Municipality of Gjirokaster: coordination, representation, organization, social media campaign. Ministry of Education & Culture: coordination, organization, outsourcing Civil protection of Albania: expert support (lectures, presentations, workshops, consultations, world café), social media campaign.
Beneficiaries	Citizens and students of Gjirokaster
Indicative funding sources	Participation in relevant calls for projects' proposals and further explore of: EU Funds (Instrument for Pre-Accession Assistance, co-financing programs e.g., Interreg programs, Greece-Italy program, Balkan Med etc.), National Funds and Private Funds.

Bačka Region Action Plan

Serbia is located in a region of moderate seismic activity; however, its territory is close to regions of high seismic hazard which triggered major earthquakes in recent history. There are currently no published studies related to seismic vulnerability of existing buildings in Serbia, and performing a comprehensive assessment of cultural heritage monuments to identify risk of damage and/or collapse due to seismic actions, is a priority for the Bačka region. Also, funding allocated to preservation of cultural heritage is modest and there is a limited focus on seismic vulnerability of existing building stock and cultural monuments. Current codes do not provide adequate guidance related to conservation and seismic retrofitting of earthen structures, which are very common among cultural heritage buildings in Bačka. Lastly, there is a need for an awareness campaign related to the importance of preservation of cultural heritage in general, including the protection from earthquake effects. The action plan is outlining both the technical methodology for reducing seismic vulnerability of cultural heritage monuments for Bačka and the implementation process.

Five actions have been included as priorities for the region (Tables 12-16).

FIGURE 19 - (a,b) City of Novi Sad, one of the cities of the Bačka Region © Tourism Organisation of the City of Novi Sad.

a

b

TABLE 12 - Action no.1 of the Bačka Region Action Plan

Action no. 1	Review of information related to the existing inventory of cultural heritage buildings in historic urban centers of Bačka
Specific objective of the action	Specific objective of the action is to identify urban localities and cultural heritage buildings in Bačka to identify the localities of high priority for seismic risk assessment.
Brief description of the action	This action will be focused on selected urban centres (cities and towns) in the Bačka region. As a part of the action it is required to first develop a policy paper, which will outline criteria for the selection of urban centres and cultural heritage monuments which will be the scope of the action plan. It is anticipated that the main criteria will include seismic hazard level at the localities under consideration, as well as the number and importance of cultural heritage monuments at a specific location. A hierarchical multiple-factor classification of heritage monuments will be developed based on, among other features, their uniqueness, scarcity of structural materials, exposure (number of occupants), etc. Currently available information related to cultural heritage monuments which has been compiled by the PZZZSK is a valuable resource. For the selected cultural monuments the existing information will be expanded by including information related to construction typology, construction technology (masonry or reinforced concrete), evidence of previous structural interventions, etc. All relevant information related to cultural heritage buildings will be made available in electronic form. Due to limited financial and human resources it is not possible to consider all cultural heritage monuments and all urban centres in the Bačka region, however a policy paper developed as a part of this action and the proposed action plan could be applied at other localities in the Bačka region and the Republic of Serbia in general.
Specific activities foreseen for the implementation of the action	Development of a policy document to set up criteria for the selection of cultural heritage monuments that have priority due to potentially higher seismic risk, Review of the available technical documents and current database of recognized cultural heritage monuments in Bačka, Selection of cities/towns to be considered in the action plan based on the criteria established in the policy document, Identification of most vulnerable cultural heritage buildings according to the criteria established in the policy document, Compilation of available historic, architectural and construction information related to the selected buildings, which will be used as a reference for subsequent actions.

Reference to the policy instruments collected in the framework of the project	Cultural Heritage Law (Zakon o kulturnim dobrima), Službeni Glasnik RS, No. 71/94, 52/2011, 99/2011, 6/2020 (in Serbian).
Reference to the Good Practice	Analysis of the local seismic risk as part of the Urban Plan Baseline Framework (GP9a) Framework for pre-earthquake monitoring of public utility buildings (GP10)
Implementation timeframe	January - December 2023
Means for monitoring the implementation	Presentation of the proposed policy document to the stakeholders Meetings to present progress at the mid-term and the end of the survey
Main stakeholders involved and their roles and contribution	Managers and owners of cultural heritage buildings to manage the action and provide input to the technical experts Selected structural and architectural engineering experts from academia and/or design practice to implement the action
Beneficiaries	Cultural heritage managers, citizens of the Republic of Serbia
Indicative funding sources	Government of the Republic of Serbia, EU funds

TABLE 13 - Action no.2 of the Bačka Region Action Plan

Action no. 2	Expeditious seismic risk assessment of cultural heritage buildings at selected urban localities in Bačka
Specific objective of the action	Specific objective of the action is to perform expeditious seismic assessment of cultural heritage buildings in selected urban centres in order to identify buildings which are at high risk of damage or collapse due to future earthquakes.
Brief description of the action	This action consists of surveying selected areas (building blocks) within the urban centres of Bačka, in order to estimate seismic risk associated with cultural heritage buildings. The ADRISEISMIC methodology for expeditious seismic assessment offers a means of assessing unreinforced masonry and reinforced concrete buildings, based on their structural characteristics, height, and seismic hazard level. The survey is expected to be fast/expeditious (a walkthrough visit to the building), and will not require neither non-destructive/destructive material testing nor engineering calculations. An important objective of the assessment will be to create a comprehensive photographic archive for each cultural heritage building, which may be required for reconstruction purposes after an earthquake. The main outcome of the assessment is to identify cultural heritage buildings which are at highest risk of severe damage or collapse due to earthquake actions, according to the national seismic hazard maps and technical regulations (codes). Due to high importance of cultural heritage buildings, seismic performance objectives for the retrofit should be set to minimize chances of the structural damage and also damage to building contents. The buildings which are characterized by high seismic risk will be recommended for future seismic retrofitting interventions. The buildings will be prioritized by the seismic risk level, cultural value, exposure (number of occupants for public buildings), etc. The training of surveyors is of critical importance and needs to be organized with the assistance of civil and architectural engineering faculty members from local universities. The surveyors need to have technical (either civil or architectural engineering) background.
Specific activities foreseen for the implementation of the action	Development of a technical guideline for expeditious seismic risk assessment based on the ADRISEISMIC project methodology (in Serbian language) Development of a 1-day training programme for the technicians (engineers/architects) who are going to perform expeditious assessment Assessment at various locations by multiple teams of technicians (3 members per team) Processing of the survey results and arranging for a review by a panel comprised of experts in the field of earthquake engineering and conservation of heritage monuments Preparing a set of reports which will contain completed survey forms and a summary of the results for each location and each urban centre
Reference to the policy instruments collected in the framework of the project	Pravilnik za građevinske konstrukcije (Technical regulations for building structures). Institute for Standardization of Serbia, Official Gazette of Republic of Serbia No. 89/2019, 52/2020, 122/2020, Serbia, 2019 (in Serbian). SRPS EN 1998-1/NA:2018. Evrokod 8 - Projektovanje seizmički otpornih konstrukcija, Deo 1: opšta pravila, seizmička dejstva i pravila za zgrade (Eurocode 8 - Design of structures for earthquake resistance-Part 1: General rules, seismic actions and rules for buildings). Institute for Standardization of Serbia, Serbia, 2018 (in Serbian). SRPS EN 1998-3/NA:2018. Evrokod 8 - Projektovanje seizmički otpornih konstrukcija, Deo 3: procena stanja i ojačanje zgrada (Eurocode 8 - Design of structures for earthquake resistance-Part 3: Assessment and retrofit of buildings). Institute for Standardization of Serbia, Serbia, 2018 (in Serbian).
Reference to the Good Practice	POTROG applications (apps. regarding seismic assessment of buildings, earthquake scenarios...) (GP17) Guidelines for assessment and structural interventions on masonry buildings (GP4)
Implementation timeframe	January 2023-June 2024
Means for monitoring the implementation	Internal meetings to present the progress (number of assessed buildings) at the mid-term and the end of the project
Main stakeholders involved and their roles and contribution	Cultural heritage managers (PZZZSK and ZZSKGNS staff) to manage the action Owners of cultural heritage buildings to facilitate the assessment Selected structural and architectural engineering experts from academia and/or design practice, university students to implement the action
Beneficiaries	Cultural heritage managers, PSK
Indicative funding sources	Government of the Republic of Serbia, EU funds

TABLE 14 - Action no.3 of the Bačka Region Action Plan

Action no. 3	Development of technical guidelines for detailed seismic evaluation and retrofitting of high-risk and high importance cultural heritage buildings in Bačka
Specific objective of the action	The objective of this action is to develop technical guidelines for detailed seismic assessment and seismic retrofitting techniques for cultural heritage buildings which will be applied in future seismic retrofitting projects in Bačka.
Brief description of the action	This action will be focused on developing technical guidelines for seismic assessment and retrofitting of cultural heritage buildings with high cultural importance and heritage value which are at risk of damage or collapse due to future earthquakes. Technical guidelines for seismic assessment and retrofitting of cultural heritage buildings are currently not available in Serbia. The guidelines will outline a methodology for performing detailed seismic assessment of buildings, based on guidelines/codes from countries with extensive experience in this area, such as Italy, Greece, New Zealand, USA, etc. The guidelines for seismic retrofitting will address both design and construction aspects of seismic retrofitting. The focus will be on seismic retrofitting approaches which are feasible for cultural heritage buildings and take into account conservation requirements. Guiding principles related to the conservation of heritage structures, as recommended by the UNESCO and other relevant organizations, will be considered while developing technical solutions for seismic retrofitting (European Union, 2018; UNESCO, 2013; Stovel, 1998). The guidelines will outline traditional seismic retrofitting techniques, which involve the use of reinforced concrete, steel, etc., as well as novel technologies, e.g. Fibre Reinforced Composites (FRCs). The guidelines will be focused on unreinforced masonry structures, which constitute majority of cultural heritage buildings in Serbia and are considered to be most vulnerable to earthquake effects.
Specific activities foreseen for the implementation of the action	Review of relevant resources and best practices from Serbia and other countries Developing guidelines for detailed seismic assessment of cultural heritage buildings, including material testing, site-specific seismic hazard study, and performance-based seismic analysis, Developing a guideline for seismic retrofitting interventions of cultural heritage buildings, which will address relevant seismic/structural design and construction aspects, as well as case study design examples, and Organize a seminar to present completed guidelines to all stakeholders in Serbia - by the Serbian Association for Earthquake Engineering (SUZI-SAEE)

Reference to the policy instruments collected in the framework of the project	Pravilnik za građevinske konstrukcije (Technical regulations for building structures). Institute for Standardization of Serbia, Official Gazette of Republic of Serbia No. 89/2019, 52/2020, 122/2020, Serbia, 2019 (in Serbian). SRPS EN 1998-1/NA:2018. Evrokod 8 - Projektovanje seizmički otpornih konstrukcija, Deo 1: opšta pravila, seizmička dejstva i pravila za zgrade (Eurocode 8 - Design of structures for earthquake resistance-Part 1: General rules, seismic actions and rules for buildings). Institute for Standardization of Serbia, Serbia, 2018 (in Serbian). SRPS EN 1998-3/NA:2018. Evrokod 8 - Projektovanje seizmički otpornih konstrukcija, Deo 3: procena stanja i ojačanje zgrada (Eurocode 8 - Design of structures for earthquake resistance-Part 3: Assessment and retrofit of buildings). Institute for Standardization of Serbia, Serbia, 2018 (in Serbian).
Reference to the Good Practice	Guidelines for the evaluation of seismic vulnerability of buildings (GP12) Evaluation and reduction of seismic risk for cultural heritage (GP5)
Implementation timeframe	January 2023 - December 2024
Means for monitoring the implementation	Consultation meetings, both at the initial stage and at the end (when draft guidelines are completed); participants will include co-authors of the guidelines and cultural heritage managers
Main stakeholders involved and their roles and contribution	Selected structural and architectural engineering experts from academia and design practice – to develop the guidelines Cultural heritage managers (PZZZSK and ZZSKGNS staff) – to provide input and guidance during the development stage, and use the guidelines in future projects Civil engineers and architects in Serbia – as users of the guidelines Serbian Association for Earthquake Engineering (SUZI-SAEE) – to assist with the dissemination
Beneficiaries	Cultural heritage managers, academics and design engineers
Indicative funding sources	Government of the Republic of Serbia, EU funds

TABLE 15 - Action no.4 of the Bačka Region Action Plan

Action no. 4	Capacity building (training) related to seismic risk assessment and retrofitting of cultural heritage buildings
Specific objective of the action	Specific objective of the action is to develop and implement training programmes for stakeholders related to seismic risk assessment and retrofitting of cultural heritage buildings.
Brief description of the action	This action is focused on enhancing the level of knowledge as related to seismic risk assessment and retrofitting of cultural heritage buildings. While seismic risk assessment needs to be performed before an earthquake, seismic retrofitting could be performed either before or after an earthquake. Training activities need to be delivered at different levels, keeping in mind stakeholders with different educational background, skills, and experience. It is is expected that majority of stakeholders have limited background regarding the topic of the training. The following stakeholders will be targeted for this action: engineers, construction workers, and civil servants (administrators). Training materials developed by the ADRISEISMIC project team are going to serve as the main resource for this action (ADRISEISMIC Moodle Platform). Technical guidelines developed in Action no. 3 will also be included. Training activities will include seminars, short courses, and online learning modules. The participants will need to successfully complete evaluation (quiz, test) in order to be eligible to obtain a certificate of completion. It is expected that training activities will need to be delivered by professionals with adequate knowledge of earthquake engineering, including civil and architectural engineering faculty from institutions of higher education, and members of professional organizations, such as the Serbian Association for Earthquake Engineering (SUZI-SAEE). In order to ensure long-term sustainability of this action, it is important to set up a “Train the trainers” program, with an objective to identify a pool of competent trainers for future training activities. It is expected that the training will need to be periodically repeated (e.g. every 3 years).
Specific activities foreseen for the implementation of the action	Developing a long-term training programme, based on the review of available resources, both human (potential trainers) and training materials Developing training materials for different training activities Identifying organizations that are going to be in charge of delivering training, and will arrange for trainers/instructors, venues, advertisement, course/seminar fees, etc. Delivering training programmes for different stakeholders: engineers, construction workers, and civil servants (administrators)
Reference to the policy instruments collected in the framework of the project	N/A
Reference to the Good Practice	N/A
Implementation timeframe	January 2023 - December 2025
Means for monitoring the implementation	Summary reports after training activities by the trainers; surveys of the training participants
Main stakeholders involved and their roles and contribution	Cultural heritage managers (PZZZSK and ZZSKGNS staff) to provide input regarding the training curriculum Educational institutions (SUZI-SAEE, university faculty, practicing engineers) and cultural heritage managers to implement the training Engineers, architects, construction workers, administrators (including owners and managers of cultural heritage buildings) to receive the training
Beneficiaries	Cultural heritage managers and owners, academics and design engineers, citizens of the Republic of Serbia
Indicative funding sources	Government of the Republic of Serbia, EU funds

TABLE 16 - Action no.5 of the Bačka Region Action Plan

Action no. 5	Raising public awareness related to the need for protection of cultural heritage from the effects of natural disasters
Specific objective of the action	Specific objective of the action is to raise awareness among general public (citizens) regarding the importance of cultural heritage and its protection from the effects of earthquakes and other natural disasters.
Brief description of the action	This action is focused on raising awareness related to the importance of cultural heritage and its protection from the effects of natural disasters. Given the limited experience related to raising awareness related to importance of cultural heritage in Serbia, it is critical to build on best practices from other countries, especially countries with frequent earthquakes, e.g. Italy, Greece, etc. The action needs to cover, among other topics, awareness of potential risks of structural and non-structural damage in a heritage structure during an earthquake, which could cause a loss of cultural heritage and potential injuries/fatalities. It is also important to include awareness of and familiarity with emergency procedures during and after an earthquake, which are critical for the survival of occupants in an earthquake. Finally, it is important to use the awareness campaign as an opportunity to emphasize the importance of preservation of cultural heritage in Serbia, irrespective of earthquakes and other disasters. The awareness campaign should target citizens of all ages, ranging from school children to senior citizens. It is critical to ensure long-term sustainability of the action, because some of the activities need to be repeated on annual basis. It is important to engage local primary and secondary schools in the action and raise awareness among the school children.
Specific activities foreseen for the implementation of the action	Planning of a public awareness campaign, based on the review of successful examples from other countries in the region (e.g. Italy), Development of educational/awareness materials, such as brochures, manuals, videos, etc., Dissemination of the materials through Internet, social media, news (TV, newspapers), and Organization of public lectures at various municipalities in Bačka.
Reference to the policy instruments collected in the framework of the project	N/A
Reference to the Good Practice	"EDURISK" - increasing knowledge and awareness of seismic risk in schools (GP15) "I don't take risks" - national awareness campaign for risk prevention and preparedness (GP13) Guidelines for planning and execution of civil protection drills (2nd edition) (GP19)
Implementation timeframe	January 2024 - December 2025
Means for monitoring the implementation	Summary reports after the awareness activities by the implementing agencies; surveys of the awareness campaign participants
Main stakeholders involved and their roles and contribution	Cultural heritage managers (PZZZSK and ZZSKGNS staff) and earthquake engineering experts - to provide input regarding the content Public relations firms - to develop the content implement the action
Beneficiaries	Cultural heritage managers, civil protection, citizens of the Republic of Serbia
Indicative funding sources	Government of the Republic of Serbia, EU funds

Region of Crete Action Plan

The whole island of Crete is highly threatened by a high magnitude earthquake and therefore it has led the Greek state to form a very high level anti-seismic code for building construction. Nonetheless, there is still the need to foster a better knowledge of the total seismic vulnerability of a historic settlement (city or village). It is intended as a more comprehensive assessment of the ground expected movement during an earthquake, as well as the specific seismic vulnerability of the building, according to its building material and characteristics. Another point of attention for the Region of Crete is the economic assessment of the seismic rehabilitation process, that should be preferably focused on each historic building block, so as the municipality can have an estimation of the total rehabilitation cost of the area, and forward it to the central state. Lastly, there is the need of increasing awareness of the historic building owners / managers, (i.e. the knowledge of the risk of using a historic building that has not been seismically reinforced) and to produce emergency plans tailored to the specific areas.

Five actions have been included as priorities for the region (Tables 17-21).

FIGURE 20 - (a,b) City of Rethymno, one of the cities of the Region of Crete. (a) © C Messier via Wikimedia Commons; (b) © Giulia Marzani.

TABLE 17 - Action no.1 of the Region of Crete Action Plan

Action no. 1	Common Seismic Vulnerability estimation tool
Specific objective of the action	The specific objective of the action is to produce the most suitable seismic vulnerability estimation tool,
Brief description of the action	The specific objective of the action is to produce the most suitable seismic vulnerability estimation tool, so as an engineer can rapidly evaluate the seismic vulnerability of a building. Greek Earthquake Planning and Protection Organization has produced a procedure named “Framework for pre-earthquake monitoring of public utility buildings” It can also be applied on private buildings. The objective is to combine this tool with the ADRISEISMIC methodology of rapid seismic vulnerability assessment of RC and mansonry buildings, thus producing a valid seismic vulnerability estimating tool available for field engineers
Specific activities foreseen for the implementation of the action	To compare this tool with existing tools, like the primary earthquake vulnerability estimation method of EPPO (Earthquake Planning and Protection Organization). EPPO is currently comparing the ADRISEISMIC method with its own evaluation method, though testing it in school buildings that have already been evaluated by EPPO To provide the existing tool to relevant scientific groups(Universities, Institutes etc) for their opinion To validate this tool by testing it in the field, via selected applications To form a widely accepted seismic vulnerability estimation tool, which, via the above steps, will be audited for its applicability on every (or certain) type of buildings To make it available among stakeholders, practitioners and the rest relevant experts
Reference to the policy instruments collected in the framework of the project	Seismic norms: Eurocode 6, 8 Building regulations: KANEPE, KADET Seismic incentive framework: Framework for pre-earthquake monitoring of public utility buildings
Reference to the Good Practice	Guidelines for the evaluation of seismic vulnerability of buildings (GP12)
Implementation timeframe	2023 - 2028
Means for monitoring the implementation	Presenting the field scanning results to the stakeholders through organized lectures/workshops
Main stakeholders involved and their roles and contribution	Region of Crete and/or Local Municipality: application of the experimental tool on public building Technical Chamber of Greece: coordination and expert support
Beneficiaries	Governmental entities and governmental - nongovernmental institutions
Indicative funding sources	EU, Recovery and Resilience Facility, This European Territorial Cooperation), Multiannual Financial Framework

TABLE 18 - Action no.2 of the Region of Crete Action Plan

Action no. 2	Economic incentives for historic building restoration
Specific objective of the action	The specific objective of the action is to provide financial incentives to the historic building managers to renovate and seismically reinforce their building
Brief description of the action	A major problem for Greece and particularly for Region of Crete is the costs involved in the process of renovating and reinforcing a historic building. Many such buildings are left to collapse due to the lack of economic ability of the owners. Such buildings also have a large vulnerability due to an earthquake. Economic incentives towards that direction on behalf of the state would form a framework in which, the managers of historic buildings would be able to finance the restoration process. The economic incentive could be in the form of bank loan with low or no interest rate, tax reduction, etc. This action could also solve another problem anticipated in historic building restoration: ownership. It is often the case that a historic building is under the ownership of numerous units – people, making it difficult to agree on a certain plan and offer financial participation on a conventional retrofitting process (by own economic means)
Specific activities foreseen for the implementation of the action	Greece is devided (by EPPO) into three (3) seismic risk zones, according to the ground acceleration expected during the earthquake. Moreover, microzonation studies (where performed) should give the state a clear picture of ground behaviour and possible risks (acceleration, liquefaction etc). According to the above results, the Greek State should decide which areas should be more affected after an earthquake, and define the zones in which buildings should be initially eligible. Further conditions to be taken into account, are: type and age of buildings, building importance (public or private), as well as maximum amount of finance per building. In order to obtain the aforementioned goals, it would be more effective, if primary data was collected through regional / local scale. Downscaling the analysis of seismic vulnerability (along with action 5), allows the clarification of geotectonic circumstances and the adaptation of intervention measures, to the particular needs of each territory. After having collected the required data, and having defined the local vulnerability zones, Regional Governance will upscale seismic protection demands officially to the national government. This way, priority to restoration incentives will be given to specific areas, following the local documented vulnerability research.
Reference to the policy instruments collected in the framework of the project	Seismic norms: Eurocode 8 Building regulations: KANEPE, KADET Concrete and Steel Building Regulation
Reference to the Good Practice	Sismabonus - national incentives for seismic retrofit of buildings (GP11) – developed for cultural buildings as well
Implementation timeframe	2023 - 2028
Means for monitoring the implementation	Presenting the field scanning results to the stakeholders through organized lectures/workshops. Actions will be held firstly at regional / municipal level, and conclusions from such interaction will be addressed subsequently at national level.
Main stakeholders involved and their roles and contribution	Greek State (coordination, monitoring and financing of the progress), Region of Crete and/or Local Municipalities (applications), Technical Chamber of Greece (coordination and expert support), Banks, Association of insurance agencies of Greece
Beneficiaries	Historic building owners, inhabitants being threatened by security and Civil Protection issues
Indicative funding sources	EU, Recovery and Resilience Facility, European Territorial Cooperation, Multiannual Financial Framework (NOTE: a financial tool called “PRESERVE” is already designed by the Ministry of Environment, to save the country’s preserved building stock from being abandoned; the action will be financed from the Recovery Fund with a budget of 200 million €). The program, ensures public safety since many of the buildings are outdated and dangerous, due to financial inability of their owners to maintain them. For the 9.300 cases recorded all over the country, hopefully the ADRISEISMIC outcomes, will be of high importance, when implementing interventions within this framework.

TABLE 19 - Action no.3 of the Region of Crete Action Plan

Action no. 3	Seismic microzonation survey
Specific objective of the action	The specific objective of the action is to perform a thorough microzonation survey
Brief description of the action	Seismic microzonation surveys can detect ground characteristics and performance during an earthquake, thus defining down to very detailed scale, the ground seismic performance, and transferring it to the type of buildings located in the specific area. Seismic microzonation uses geophysical, geotechnical and geological methods and surveys to survey the ground in which the buildings are founded, and resemble the earthquake movement. Seismic microzonation surveys should be obligatory to municipality level, mostly in the cities located in zone III and II of the Greek seismic vulnerability map. To date, such surveys have been performed in various cities, but are not obligatory by law to the municipalities.
Specific activities foreseen for the implementation of the action	Performing field scanning (geological, geophysical geotechnical investigation and data collection, seismic scenarios, seismic vulnerability assessment of buildings according to their importance, seismic vulnerability assessment of building blogs in of a city, formation of emergency scenarios according to the city's peculiarities and population density etc) These are usually conducted by universities, and the specific plan of the survey and the deliverables are formed in conjunction with the owner and beneficiary of the study Presentation of the results to the local brunch of the Technical Chamber of Greece and the possible related stakeholders (state and/or local administration entities)
Reference to the policy instruments collected in the framework of the project	Seismic norms: Eurocode 8 Building regulations: KANEPE, KADET, EAK 2000, Steel And Concrete Manual
Reference to the Good Practice	Analysis of the local seismic risk as part of the Urban Plan Baseline Framework (GP9a) Seismic Microzonation (SM) foreseen in the Urban Planning Baseline Framework (GP9c)
Implementation timeframe	2023 - 2028
Means for monitoring the implementation	Presenting the field scanning results to the stakeholders through organized lectures/workshops. Since some of the stakeholders (state central or local public administration entities) are also decision makers, they can adjust their seismic, urban and special planning policies according to the results of the microzonation study. The results can also be transferred to the Ministry of Infrastructure as well as the Ministry of Environment, in order to issue special urban and special planning provisions for certain areas of the specific city
Main stakeholders involved and their roles and contribution	Greek State – make seismic microzonation obligatory for a municipality Local Municipality: applications Technical Chamber of Greece: coordination and expert support / difuse the results among its members – engineers.
Beneficiaries	Local administration entities
Indicative funding sources	EU, Recovery and Resilience Facility, European Regional development Financial Framework

TABLE 20 - Action no.4 of the Region of Crete Action Plan

Action no. 4	Raising public awareness
Specific objective of the action	The specific objective of the action is increase public awareness against earthquakes and their consequences.
Brief description of the action	The specific objective of the action is to inform various groups of the Greek society, especially the more vulnerable ones (Erdely, Disabled, under temporary medical treatment etc) about the direct and indirect consequences of an intense earthquake that may affect their province. The action should be offered at various levels of education providers (schools, civil protections entities, first responders etc) so as to be available to every societal group (disabled, schools, elderly, public and private companies stuff etc)
Specific activities foreseen for the implementation of the action	1. to access the needs for education on certain societal groups, as well as on general society. Certain groups may be the elderly, disabled, schools, special health care institutes (hospitals, private clinics etc). Also public and private companies employees, general public. 2. to locate possible educators (civil protection certified educators, school teachers, etc) 3. to form the education material and validate it in terms of quality and quantity 4. to define the education process (location, modality (face to face or distance) duration, education material, attendees) 5. to finance the procedure 6. to implement the education procedure and validate it through que questionnaires In the above procedure, existing platforms like the ADRISEISMIC Moodle Platform or other similar existing ones (EVANDE, CP Risk etc)
Reference to the policy instruments collected in the framework of the project	Seismic incentive framework: Guidelines for planning and execution of civil protection drills (2nd edition), General Civil Protection Plan concerning earthquakes 1st edition, code name Engelados, Law 4662/2020 “National Disaster Management Mechanism, reformation of General Secretary of Civil Protection, CP voluntary system and reform of the Fire Unit”
Reference to the Good Practice	“I don’t take risks” - national awareness campaign for risk prevention and preparedness (GP12)
Implementation timeframe	2023 - 2028
Means for monitoring the implementation	Monitoring of actions, evaluation of emergency drills, questionnaires
Main stakeholders involved and their roles and contribution	Region of Crete and/or Local Municipality: public campaign; First Responders: school visits and demonstration of emergency actions; Ministry of Education: incorporate natural disasters in school program; Universities
Beneficiaries	General public, special groups, schools
Indicative funding sources	Greek State, Recovery and Resilience Facility

TABLE 21 - Action no.5 of the Region of Crete Action Plan

Action no. 5	Providing Seismic Vulnerability Maps, through Crete Region's Geospatial Infrastructure (GIS Crete)
Specific objective of the action	The specific objective of the action is to increase public awareness against earthquakes, as well as professional knowledge about regional seismicity.
Brief description of the action	The aim of the action is to inform any target group which is interested, about the recent seismicity in the island territory. This will be feasible, by providing shakemaps in several regional units, after every incident of low or high magnitude. This way, there can be produced (if needed) direct and indirect conclusions about the vulnerability of particular areas, contributing to the planning ahead. The maps will be available to everyone who is interested, not yet defined if in an "open data" form, or provided on demand only to professionals and policy makers (in order to avoid citizens' anxiety deriving from data misinterpretation).
Specific activities foreseen for the implementation of the action	Through a dynamic geospatial platform already developed by RoC, local shakemaps are provided, with data collected through a seismological network of 14 stations, installed in the main cities. Shakemaps can be the baseline of creating new seismic vulnerability maps of cities of Crete and demarcate high risk areas, with historic buildings in them. Along with the action of register and digitize the amount of historical buildings, there may be a combination of how many of them (and which in particular), are included in the high vulnerability zones, defined.
Reference to the policy instruments collected in the framework of the project	Seismic Norms: this tool will be beneficial for all of the subcategories, referring to seismic norms regulative processes.
Reference to the Good Practice	N/A
Implementation timeframe	2023 - 2028
Means for monitoring the implementation	Monitoring will be feasible and constantly updated, through the Infrastructure Platform of Crete Region GIS CRETE. Visiting the website https://gis.crete.gov.gr/sdi/and choosing the division of "Culture", someone can rapidly have an overview of vulnerability zones and by adding the layer of "historical buildings", can have their spatial distribution within these zones.
Main stakeholders involved and their roles and contribution	Region of Crete is the main provider of this opportunity and/or Local Municipalities that have already this infrastructure can interact and support. Ministry of Education. Ministry of Cultural heritage. Ministry of Digital Governance. Ministry of Infrastructure.
Beneficiaries	General public, professionals, special groups, schools, national and regional government, municipalities, chambers, universities, researchers, archeologists, cultural stakeholders, etc
Indicative funding sources	Greek State, Ministry of Environment, Ministry of Digital Governance, Crete Region

ADRISEISMIC Moodle platform

In parallel to the harmonisation of the normative and planning framework and the development of the ADRISEISMIC methodology, particular attention was also posed to the enhancement of skills and knowledge of all the actors involved in the seismic retrofitting process since there is a lack of specific and highly skilled figures to properly deal with seismic-related issues in the built-up environments.

The new knowledge, methods, strategies for seismic vulnerability reduction provided by ADRISEISMIC have been integrated into more effective training programmes for professional figures to be spread transnationally, providing high quality and homogeneous qualifications in the sector. In addition, the setting-up of a Moodle platform allows to establish a transnational cooperation network to jointly tackle the environmental vulnerability from seismic risk, which is one of the ADRISEISMIC outcomes, and enable both project partners and associated partners to catalyse the attention towards the topic of environmental vulnerability issue enhancing the knowledge of the various organisations joining the network.

For these reasons, the **ADRISEISMIC Moodle Platform** (Figure 21) has been designed and set-up since the beginning of the project, and it has been conceived not only as a tool for uploading the training materials developed through the project to be shared with the stakeholders and the broad public, but also an entry point to collect the interest from various stakeholders to be part of the project transnational cooperation network.

The Moodle platform has been installed by the University of Crete and it is hosted in its data center. It is available at the link https://adriseismic.nhmc.uoc.gr/ and includes all the training packages that have been developed within the project, addressing the target groups of:

- Practitioners,
- Building Workers,
- Civil Servants,
- Volunteers.

The training packages are aimed at reducing the existing knowledge gap in the ADRION area related to seismic vulnerability reduction addressing the needs of all the actors involved in the seismic retrofitting process: from building workers to practitioners, from civil servants to volunteers' groups. In addition, being the platform multilingual, there are no linguistic barriers and limitation for everyone who wants to learn though online courses, especially if located in the ADRION area. In fact, beside English, the syllabi of all

the courses are available in all the languages of the project namely:

- Italian,
- Croatian,
- Albanian,
- Serbian,
- Slovenian,
- Greek.

The possibility of choosing the language, is a key feature to foster the transnational cooperation. Thus, it allowed all the project partners to tailor the contents of the lessons to their local context, with the possibility to improve the accessibility of the tool and eliminate as many barriers as possible for the development of skills related to the reduction of seismic risk.

The Italian page is the only one containing all the developed materials since the various training packages have been fully prepared to be tested at local level. Therefore, complete cycle of slides and video-lessons have been produced and uploaded on the Moodle. However, some topics have been considered of great importance for the project scope and not dependent to the local specificities. For those, video-lessons have been produced in all the languages.

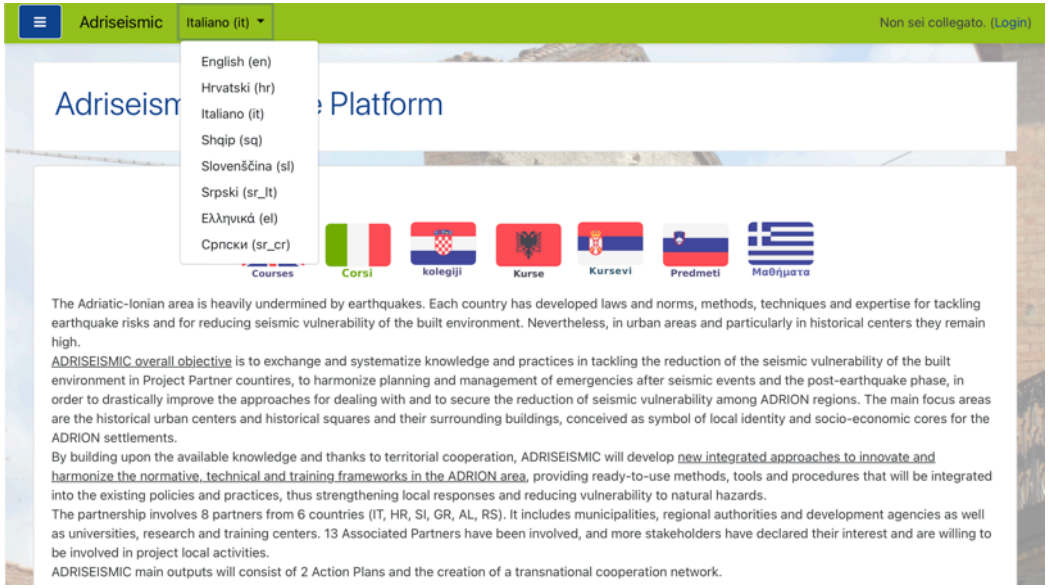


FIGURE 21 - Homepage of the ADRISEISMIC Moodle Platform

Training package for practitioners

The target group of practitioners includes all professionals who play a technical role within the entire seismic retrofitting process of historic buildings in urban centers. The preparation of the tailor-made training programs necessarily considers the previous preparation of the technicians: all the people and professional profiles included in this target should start from a good level of knowledge and technical skills on building, construction, renovation and maintenance of buildings, a level that is generally validated by state exams and registration in professional registers. For this reason, the specific skills identified in the ADRISEISMIC training toolkit for practitioners focus only on aspects and working methods that are not generally required in the daily professional activities of these technicians.

The training package is divided into 3 macro-categories (Table 22). For each macro-category a certain number of modules have been identified (TT). More than one lesson is developed per each module.

TABLE 22 - Trainging package for pratictioners

Syllabus - training package for practitioners		
TECHNOLOGIES AND TOOLS	The training modules of MC1 will deal with the methodologies and tools for the building reinforcement and retrofitting. A specific focus will be on the ICT and BIM methods for assessment and analysis of buildings. Also, the construction materials types and peculiarities will be described in detail.	
	TT1	Technology of materials for structural consolidation and restoration
	TT2	Advanced systems and tools for architectural and structural survey and graphic elaboration
	TT3	Instrumental investigation methods on building materials and components and structural diagnosis of historic buildings
	TT4	IT tools for integrated design; use of BIM in the management of the seismic retrofitting process
MANAGEMENT OF PROCESS	The modules of MC2 deal with the processes and methods for the seismic retrofitting of a historic building: in specific, the contents addressed will be norms and legislations, dynamic behavior of buildings, methodologies for temporary interventions, evaluation of the building situation	
	TT5	Reference seismic legislation, administrative procedures, specific technical standards for existing buildings
	TT6	Applied geotechnics and construction science for seismic consolidation and adjustment; the dynamic behavior of buildings and the collapse mechanism
	TT7	Technique and technology of seismic consolidation and adaptation interventions on historical buildings
	TT8	Historical-artistic research of architectural complexes and documentary investigation of materials and techniques
	TT9	Integrated design: materials and techniques for energy retrofitting and plant adaptation of historic buildings
	TT10	Technical temporary interventions to protect and stabilize buildings in emergency and post-earthquake situations
	TT11	Final evaluation process and static testing of seismic adjustment interventions
TRANSVERSAL LEARNING OUTCOMES	The modules of MC3 will have a focus on transversal topics as, for instance, urban development planning, security procedures on site, management of construction site waste	
	TT12	Elements of urban planning, enhancement and management of historic urban agglomerations
	TT13	Management of safety and health in construction sites for seismic adjustment and restoration; management of waste materials
	TT14	Project financing and economic management of seismic adjustment and restoration interventions
	TT15	Communication strategies for the promotion of seismic retrofitting of historic buildings

Training package for building workers

The target group of building workers is mainly composed of skilled construction workers or foremen who have the task of manually carrying out in seismic retrofitting sites the application processes of products. The correct implementation of these specific techniques requires a good knowledge of the technology and the effects produced on existing structures in addition to the mere manual application procedure. These are professionals who already possess a medium-high level of technical-operational and transversal skills of a generic construction worker and are already able to operate independently on a construction site.

The training package is divided into 2 macro-categories (Table 23). For each macro-category a certain number of modules have been identified (TT). More than one lesson can be developed per each module.

TABLE 23 - Trainging package for building workers

Syllabus - training package for building workers		
OPERATIONAL SKILLS	TT1	Characteristics and use of materials for the consolidation and seismic adaptation of historic buildings
	TT2	Operational techniques for anti-seismic structural consolidation
TRASVERSAL SKILLS	TT3	Reading and comprehension of executive drawings in seismic upgrading projects, extraction of numerical and technical parameters
	TT4	Technology of buildings and main traditional and modern building systems
	TT5	Collapse mechanisms of historical structures and anti-seismic consolidation methods
	TT6	Conservative restoration procedures and restoration of architectural materials and surfaces
	TT7	Safety measures in structural intervention sites and seismic adaptation of historic buildings
	TT8	Temporary reinforcement methods and techniques for structures damaged by the earthquake or statically unstable

Training package for civil servants

The target group of civil servants is mainly composed of public bodies employees, with decisional, procedural or economic responsibilities but without a (or with limited) technical training background. In specific, the focus will be on the profiles that have decision-making or administrative responsibilities, without a specific knowledge and background on the technical topics. In example, accountants and administrative profiles, experts in legal procedures, financial managers. Usually, these types of profiles have the diploma or a university degree but they are lacking technical competences dealing with seismic retrofitting of historical buildings. Their responsibilities can be linked with this field and with the public procurements on restoration of historical buildings; therefore, they should possess at least basic knowledge in this context. In addition to technical issues, the target of public employees also crosses the general principles of urban management and the legal-administrative schemes that regulate the management and enhancement of the historical-architectural heritage in the management of their work role.

The training package is divided into 3 macro-categories (Table 24). For each macro-category a certain number of modules have been identified (TT). More than one lesson can be developed per each module.

TABLE 24 - Trainging package for civil servants

Syllabus - training package for civil servants		
TECHNOLOGIES AND TOOLS	TT1	Advanced systems and tools for architectural and structural survey and graphic elaboration
	TT2	IT tools for integrated design; use of BIM in the management of the seismic retrofitting process
PROCESS MANAGEMENT	TT3	Basic knowledge of traditional and modern building materials' technology
	TT4	Applied geotechnics and construction science for seismic consolidation and adjustment
	TT5	Knowledge of the types of traditional local buildings and of the distinctive anti-seismic elements to be preserved and improved
	TT6	Knowledge of specific techniques for the seismic adaptation of historic buildings
	TT7	Knowledge of the methods of investigation, diagnosis and infographic representation of historic buildings
	TT8	Knowledge of operational techniques for the restoration and conservation of historic buildings
ADMINISTRATIVE AND MANAGEMENT SKILLS	TT9	Strategies for enhancing the cultural and architectural heritage of the area
	TT10	Project financing and economic management of seismic adjustment and restoration interventions of historical buildings
	TT11	Reference seismic legislation, administrative procedures, specific technical standards for existing buildings
	TT12	Management of safety and health in construction sites for seismic adjustment and restoration

Training toolkit for volunteers

The target group of volunteers includes people who will be experienced in civil protection procedures and mechanism. Therefore, certain knowledge and specific skills are needed. For starters, a certificate of basic volunteers' training in safety measures and risk management is necessary. In addition, volunteers must be able to read documents about the seismic mitigation in general. The lack of expertise in the field of seismic retrofitting of historical buildings, before and after earthquake, is noticeable. As a matter of fact, volunteers' training programmes provide general knowledge on seismic intervention sites and give emphasis on safety rules, risk management and provide help to the victims, but the training on cultural heritage conservation is poor, or in some cases, does not exist at all. In addition, the target group of volunteers does not have a technical background when it comes to the seismic retrofitting process of building and, therefore, they are not aware of technological and informative progress that might support their work on the field.

The training toolkit is divided into 3 macro-categories (Table 25). For each macro-category a certain number of modules have been identified (TT). One lesson is developed per each module accompanied by a specific pratical activity.

TABLE 25 - Trainging toolkit for volunteers

Syllabus - training package for volunteers		
OPERATIONAL SKILLS	TT1	Union Civil Protection Mechanism
TOOLS AND TECHNOLOGIES	TT2	Digital photogrammetry syllabus for rapid architectural and urban survey
TRANSVERSAL SKILLS	TT3	Temporary reinforcement methods and techniques for structures damaged by the earthquake or statically unstable

Establishing a new network: the international summer school on “New integrated approaches for seismic improvements of Adriatic and Ionian historic urban centres”

Besides the four training programmes, the Moodle platform has been enriched with an additional section set up under the English courses called “International Summer School on new integrated approaches for seismic improvements of Adriatic and Ionian historic urban centres”. It refers to an initiative carried on by the University of Bologna which organised a summer school on 29th August – 2nd September 2022 in Bologna in the framework of the Erasmus+ Blended Intensive Programme. The Moodle platform has been used in support of the organisation of the entire initiative and the materials stored and developed by ADRISEISMIC project have been made available to the students attending the summer school. They attended some key preparatory lectures online in their local languages, and they had the possibility to explore all the other contents uploaded. The University of Zadar, Zagreb, Belgrade, Crete have been involved and their students and teachers used the Moodle platform, creating an interesting and active network around the platform and the materials produced (Figure 22).

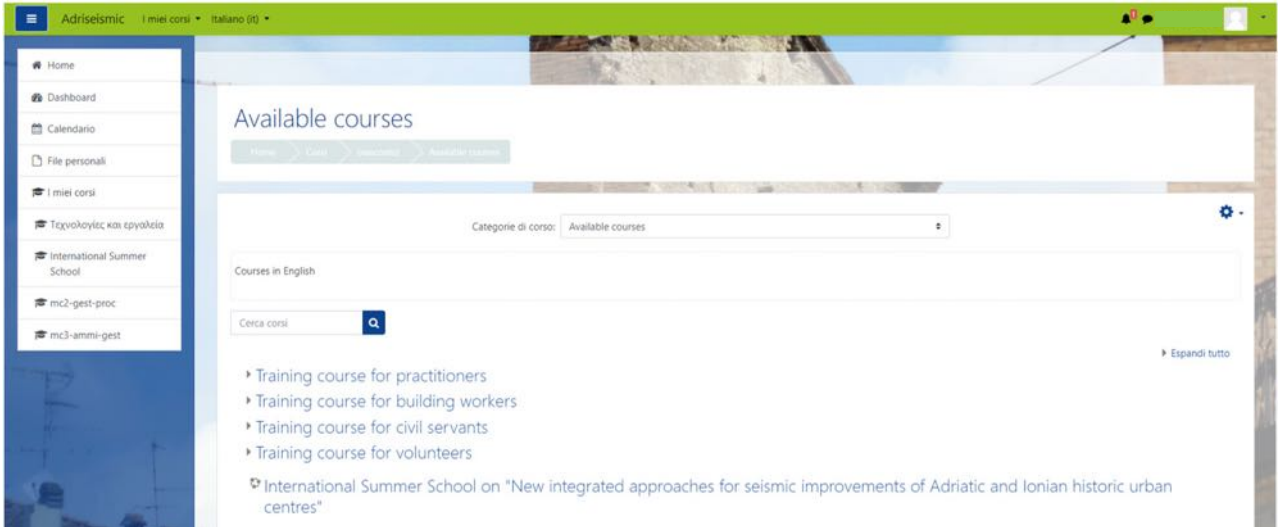


FIGURE 22 - Screenshot of the English course of the Moodle platform with a dedicated section for the International Summer school

KEY FINDINGS AND FUTURE INSIGHTS

ADRISEISMIC project has supported municipalities and regional authorities to develop comprehensive actions for adaptation to disaster risk, by engaging all the relevant stakeholders in taking actions towards seismic vulnerability reduction.

Through cooperation and knowledge exchange, ADRISEISMIC project has built a common understanding for the status quo of regulative and legislative frameworks, economic and financial tools, methodologies for seismic diagnostic investigations and retrofitting intervention techniques and of training schemes in the ADRION partner Countries. By providing new knowledge, new monitoring schemes and more effective education programmes and homogeneous qualifications in the construction sector, partners involved in the construction chain, as well as in the emergency phase after a disaster, acquired advanced knowledge and practices about diagnostic investigations and intervention techniques for the reduction of seismic vulnerability.

Action plans represent instruments for public authorities to clearly define and explain the way to integrate and adapt some of the promising good practices and/or the new expeditious seismic vulnerability assessment methodology into the current local practices, thus enhancing their replicability and scalability in the countries involved in the project but also beyond. The action plans are designed to be implemented also after the end of the project by the institutions which define them. All the Action plans developed within ADRISEISMIC project have been signed by the responsible partner to confirm the commitment towards the implementation of the actions. They are conceived as live documents which will guide the responsible public authorities to further elaborate actions towards the reduction of seismic risk, and a source of inspiration and a replicable path for additional municipalities and regions who are seeking to take actions to disaster risk reduction.

ADDITIONAL CONTENTS

Study visits

Click on the name of the study case listed below to go to the related videos of the study visits:

> *Albania*

> *Croatia*

> *Italy*

> *Serbia*

> *Slovenia*

> *Grecee*

ADRISEISMIC final event

Click *here* to watch the videos of the ADRISEISMIC final event held in Bologna on 17 January 2023.

ADRISEISMIC links

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