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ADRISEISMIC

REPORT ON CURRENT TRAININGS ON SEISMIC VULNERABILITY

WPT3 – Innovative training packages for enhancing skills and expertise for tacking seismic vulnerability

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Description of the deliverable (3-5 lines)	The report will present the collection of all best practices about trainings: current university and post university educational courses, professional trainings currently in place in each involved country in order to define the current educational offer, to be compared with the necessary skills for dealing with seismic vulnerability assessment.

Key words	Seismic retrofitting, training programmes, practitioners, workers, civil servants, volunteers, analysis of training providers

Document history

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Definitions & Acronyms

Acronym	Full name
CA	Consortium Agreement
PP	Project Partner
LP	Lead Partner
WPT	Technical Work Package
PP2	Institute for Vocational Training of Construction workers in the province of Bologna – I.I.P.L.E.
RSPP	Responsabile Sicurezza Prevenzione e Protezione (Security, Prevention and Protection Responsible)
RLS	Responsabile Lavoratori per la Sicurezza (Workers Representative for Security)
DDL	Datore Di Lavoro (Employer)
FAD	Formazione A Distanza (online learning)

Executive summary

The deliverable will describe the state of the art of current training courses and curricula in the countries involved in ADRISEISMIC project, in the field of seismic vulnerability, and the connected learning needs.
The territories of the involved countries host buildings of considerable architectural, historical and cultural value. Unfortunately, these territories are frequently subject to the action of earthquakes. The frequency and intensity of these events puts the architectural heritage of these countries in a highly vulnerable condition.
For the partners of Adriseismic consortium, structural safety in buildings is a very relevant topic for which more and more resources are being used, especially in the reinforcement of existing structures.
One of the aims of the project is, therefore, improving the working profiles and techniques involved in tackling the seismic vulnerability of historic buildings. Adriseismic will not only address theorical aspects of the problem but will also develop and implement practical pilot actions in selected buildings. The conclusions obtained from these experiences will help to identify transferable best practices, which could be exported and replicated in countries outside the project consortium.

1 Introduction

Work Package 3 of Adriseismic Project, aims at improving the knowledge and skills of all the figures involved in the seismic retrofitting process and to make their contribution to the reduction of the seismic vulnerability more effective. Despite the different training programmes currently in place in each involved country, there is a lack of specific and highly skilled profiles related to the mentioned issues in the construction field. The first activity of WPT3 was the analysis of the current state of technical and professional training in the involved countries dealing with the seismic retrofitting of historical buildings, considering the entire construction sector and the volunteers involved in rescue activities. The aim is to bridge knowledge gaps among operators, enabling a more fruitful cooperation and communication within them, and thus to smooth emergency operations (allowing also a prompt return to normality) and enhancing the community resilience.
The second step of the WP will be the development of 3 specific training packages for Practitioners, Civil servants and Workers, plus a specific module for the training of volunteers. These materials will be shared with the Consortium and the stakeholders on a MOODLE platform created ad hoc, to jointly enhance the capacity in tackling environmental vulnerability. All PPs will be involved in tailoring effective learning methods and materials, to create more effective training programmes, in order to enhance the competencies and skills of all the technicians involved in the construction process and of the volunteers involved in rescue interventions.
The activities connected with WP3 have started in July 2019 and will end in August 2022.

1.1 Objectives and structures of the deliverable

Deliverable 3.1 is titled “Report on current training on seismic vulnerability” and, as already explained, deals with the gaps in the training offer for practitioners, workers, civil servants and volunteers in the field of seismic intervention.
This document has been divided into chapters, following the different phases of research and analysis activities led by IIPLE: in chapter 2 is depicted the current situation of training offer; the partners have listed the training providers (divided by category and country) and collected the programme of each training course available in the field of seismic retrofitting and vulnerability. The results are divided into 6 different paragraphs, one for each country.

In chapter 3, the rationale behind the selection of target groups involved has been better defined. Moreover, the partners have also tried to contextualize the working profiles involved, by depicting their academic and experience background. Each partner has created a sort of curriculum for the 4 target groups, explaining which title they should possess, how many years of experience are mandatory for them to work in seismic sites and so on.
In chapter 4, the focus is on the competences that each of the working profiles should possess in order to operate on a vulnerable existing building or on a building affected by a seismic event, for the prevention of damages and for its seismic retrofitting. These skills and knowledge have been generally named "learning units" and have been validated by stakeholders and experts of each country of the consortium, during local virtual events. Each partner has then tried to understand which of the mentioned learning units are already covered by the training programmes available in each country. The main findings are evaluated for the specific country and from an overall point of view in the conclusive paragraph of the deliverable.

1.2 Data collection methodology

In this paragraph is briefly explained the methodology implemented, in order to collect data to:
- analyse the existing offer in term of providers and training curricula,
- analyse the required skills and competences identified in relation to the learning units.

IIPLE, as leader of this task, has organized the work in different steps and has developed guidelines for the partners to instruct them on the strategy adopted; this document is available as Annex 1 of Deliverable 3.1.1 "Guidelines for activities of task 3.1.1".
The template used for the first step of this analysis has been developed by IIPLE: as shown in figure 1-1, the first tool designed and shared with partners was aimed at collecting in a standard format a list of all national public or private entities that provide training related to seismic retrofitting[1] at all levels. It is a table where all the training providers have been listed, with the original name and the English translation, the territorial extension, the type of training provided, the address of the main office and website address. Moreover, in order to better compare the results, partners have also created 3 different .xls cartels so as to divide providers into different categories: University (academic in general), high schools, others (e.g., professional training, companies, public bodies).
These lists of providers for each of the partners involved, will be also uploaded on the Moodle Platform created within the project and on the official website. One of the major criticalities for all the institutions involved, has been the difficulty in identifying the different providers; in fact, in none of the countries considered is available a public list of training providers and the research is even more complex if the provider has a different legal entity than the "researcher". For instance, for a public administration or University, is not easy to obtain information on a big company which organize trainings for workers.

[1] Seismic retrofitting is the modification of existing structures to make them more resistant to seismic activity, ground motion, or soil failure due to earthquakes.

WPT3 - activity T3.1: Innovative training packages for enhancing skills and expertise for tackling seismic vulnerability

Contry	N°	ABBREVIATION AND COMPLETE NAME	NAME IN ENGLISH	NATIONAL EXTENSION	LOCAL EXTENCION	FORMAL "STANDARD" EDUCATION	SPECIFIC TRAINING	ADDRESS OF THE MAIN HEADQUARTERS - WEBSITE
			EXAMPLE					
IT	5	FORMEDIL - ENTE NAZIONALE PER LA FORMAZIONE E L'ADDESTRAM	FORMEDIL - NATIONAL AUTHORITY FOR TRAINING AND PROF	YES			YES	Via Guattani 24, 00161 ROME, ITALY http://www

Figure 1-1 Template for the collection of training providers

After these first considerations, it was important to investigate the types and characteristics of the training offered by the previously mentioned providers; not all the programmes are equal, from the point of view of duration, approach, practical skills provided. IIPLE has therefore asked the other partners to collect standard information on the training courses identified in the previous step of the research. Also, for the implementation of this task, partners have received a form (Annex 3) to be filled with the following information:

1- name of the providing organization,
2- funding source of training,
3- eventual fee for the participants,
4- target groups and direct beneficiaries,
5- maximum number of participants (if applicable),
6- total number of training hours,
7- overall topic of the course,
8- specific contents and length of the modules,
9- teaching methods and technical tools used,
10- didactic material provided or published,
11- period in which the training took place,
12- number of editions of the course (if applicable),
13- certification/qualification/diploma/credit recognized (if applicable).

The training forms filled-in by partners have been collected and stored in the project google drive folders.

When considering the different profiles involved in this phase of research, in order to better understand the contexts and characteristics, IIPLE has asked partners to give standard information on the training path of the different profiles involved in WPT3 activities. A list of questions to better define these professionals and workers, has been sent to the partners and is attached in Annex 4 “Template for the description of curricula profiles”.

The following step of the research conducted by IIPLE has been the analysis of the fundamental areas of expertise that each of the considered target groups should possess. The list of learning units for practitioners, workers, civil servants and volunteers has been developed on the basis of the previous research and the

feedback received by partners; once the lists were completed, the consortium has asked selected groups of stakeholders and experts to validate it. This happened through local events, in all of the 6 countries involved in Adriseismic project.

The final step of task 3.1, was the comparison between the list of learning topics and the effective training offer provided: the aim of this analysis was to highlight the correspondences and the eventual gaps, in order to define a new and complete specific training programme.
In order to collect the partners feedback, IIPLE has developed and shared a matrix template, designed specifically for this purpose. In the xls file (Figure 1-2), partners had to highlight which area of competence was included in the available training programmes identified, for each of the target groups.

3				PRACTITIONERS (DESIGNERS AND TECHNICAL SUPERVISORS) ARHITECTS, ENGINEERS, SURVEYORS																
4				KNOWLEDGE AND SPECIFIC SKILLS IN RELATION TO THE PROFESSIONAL ROLE IN THE PROCESS																
5			Note:	s tructural consolidation and restoration	tion interventions on historical buildings	or seismic consolidation and adjustment	vestigation of materials and techniques	tructural survey and graphic elaboration	structural diagnosis of historic buildings	gement of historic urban agglomerations	s for seismic adjustment and restoration	ergency and post-earthquake situations	echnical standards for existing buildings	djustment and restoration interventions	nd plant adaptation of historic buildings	ement of the seismic retrofitting proces	ing of seismic adjustment interventions			
6			CURRICULUM AND TRAINING TOOLS FOR ACHIEVING	A	B	C	D	E	F	G	H	I	J	K	L	M	N			
7			Professional qualification or license Mandatory level and curriculum criteria established by law in order to perform the role																	
8	1	"Standard" school system	Vocational training school or professional qualification (lower																	
9	2		Upper secondary school for surveyors, restorers, building experts (high school diploma)																	
10	3		University, high school diploma, short or specialist degree, master	Example: specialist civil engineering degree / short degree in architecture																
11	4	SPECIFIC TRAINING ON THE THEME	Specific school subjects entirely coinciding with the competence																	
12	5		Specific school subjects partially coinciding with the competence																	
13	6		Post-diploma education dedicated to the seismic topic																	
14	7		Post-graduate education Master entirely dedicated to the topic																	
15	8		Specific training, lasting 100 - 600 hours in total or even more (normaly 1 year)																	
16	9		Specific medium-term training 30 - 100 hours in total																	
17	10		Theoretical and practical training of anti-seismic products and techniques maximum 30 hours in total																	
18	11		Workshops dedicated to the seismic theme lasting up to one day																	
19	12		Preparation courses for civil service volunteers 20-30 hours																	
20	13		Periodic updating courses maximum up to one day																	
21	14		Seminars, conferences and meetings lasting up to one day																	
22	15		Specific FAD or E-learning distance learning of any duration																	
23	16	nces	Internships, traineeships, apprenticeships in the area of competence (planning, public administration, implementation of interventions)																	

Figure 1-2 Matrix template for cross-check of training programmes available and learning units covered

In order to identify the gaps and the areas of knowledge which should be improved, and considering that the number of training programmes identified by each partner varies consistently, IIPLE has decided to focus on the 17 categories of training considering them as essential to depict the state of the art of and to identify the gaps (listed on the left side of the .xls file), instead of the actual number of curses identified for each country. For each field of knowledge (listed in the columns), IIPLE has determined the number of courses in which the topic has been included, in order to identify the necessary improvements in the training offer.
The described analyses have been separately performed for each of the target groups, in order to compare the results. A preliminary conclusion on this step of the research is in paragraph 4.7.

2 The identification of the target groups involved

The main aim of the Adrisesmic project is to tackle the seismic vulnerability of the built environment, specifically of historic buildings. Each of the countries involved in the activities has a different approach to manage emergencies and seismic events, to reconstruct and seismically adapt existing buildings. In the activities of WPT2, therefore, the University of Bologna (in collaboration with the consortium) has collected and analyzed the existing methods and procedures, in order to develop and introduce new advanced expeditious assessment of seismic vulnerability and seismic retrofitting.

In parallel with these research activities and the collection of current practices in the partner countries, IIPLE analyzed in WPT3.1 all the professional figures that play a specific role in the seismic retrofitting process.

The identification of the professionals involved in the seismic safety of existing buildings necessarily requires the analysis of the seismic retrofitting process in the various consecutive phases. The main activities that make up the logical sequence of the process are summarized below:

- Development of awareness on the opportunities and advantages of seismic safety by the owners of historic buildings and buildings (potential private clients, companies owning historic buildings, public and mixed entities),
- Analysis of the context and technical-economic feasibility study of the necessary interventions (clients, engineers, architects, officials of public bodies managing the historical-architectural heritage, financial consultants),
- Technical design of interventions: survey and structural and morphological analysis of buildings, definition of the levels of improvement / seismic adaptation to be achieved also in relation to current legislation, design of structural interventions, architectural design, design of systems and functional adaptation of spaces, preparation of specifications and technical documentation for the management of tenders (designers: surveyors, geologists, architects, engineers, plant engineers, restoration experts, public administration technicians qualified to design),
- Bureaucratic procedures for approving the project and interventions (civil servants and public employees of technical offices, technicians and freelancers as listed above),
- Management of tenders and assignment of works to be performed (public or private clients, technicians, construction and restoration companies),
- Construction site management and execution of the works (technicians and workers of construction companies, freelancers, public employees of the inspection and control bodies, clients),
- Testing and delivery of works (engineers, architects, construction company technicians, clients).

From this brief analysis of the process, the presence of four subjects predominantly involved is evident:

1- Clients
2- Professional technicians
3- Construction companies
4- Public bodies

With regard to the first subject, in the process of securing existing historic buildings, cultural preparation, awareness of the advantages and financial capacity of the clients play a fundamental role in the activation and

initiation of the process itself. For this reason, a further study on the typology of the clients currently involved is important.

With this in mind, the following subgroups of clients can be easily highlighted:

- private citizens who own apartments or historic buildings,
- private companies or financial groups (foundations or banks) owners or managers of properties in historic urban centers,
- public bodies that own or manage the urban architectural heritage (public foundations, municipalities, regions, state, army, etc.).

The last subgroup often constitutes the preponderant one in the case of historic urban centers and in daily practice involves various figures of public employees (managers, officials, technicians, employees). The latter, together with public employees who deal with the bureaucratic and procedural process of the retrofitting, constitute the second target group of our project.

As for the construction companies involved, generally the professional figures are those of technicians and skilled workers who physically carry out the seismic adjustment works. For this reason, the recipients of the third target group will be all construction workers, excluding the technicians of the construction company who instead fall within the first target group of professionals.

From this brief analysis of the subjects involved, three main target groups have been identified, thus also confirming the input and general indications of the ADRISEISMIC project:

- Practitioners (including surveyors, engineers, architects, topographers and other technicians in the role of designers, work supervisors, company technicians, static testers, working as freelance practitioners or for public bodies);
- Civil servants (public bodies employees, with decisional, procedural or economic responsibilities that don't have a technical training background);
- Skilled workers (foremen, construction crew chiefs, experienced workers, operative profiles in construction companies);
- Civil protection volunteers.

As clearly underlined by the range of profiles mentioned, it has been considered the whole process linked with the seismic retrofitting of an historic building: the political decision and financial evaluation procedure, the expeditious assessment, the definition of the intervention project, the bureaucratic iter for the approval, the definition of the call for tenders, the selection of the professionals, the working activities on site, the final tests, the commissioning.

In order to be involved in seismic assessment, renovation and retrofitting procedures, the above-mentioned profiles must have deep knowledge and experience in the field of seismic vulnerability (in some cases) and at least a superficial and general understanding of the different steps and activities. The current training courses, identified and analyzed in this deliverable, are targeted to different categories or groups of profiles, as the contents and materials are specifically developed according to the already possessed knowledge and backgrounds

2.1 Detailed description of curricula and background of the target group's profiles

IIPLE has analyzed the training and experience background that the different profiles should possess, in order to carry out activities linked with seismic assessment and retrofitting. This information has been considered and compared for each target group.

Practitioners

In Albania, the current legislation and technical regulations define the professional figures able to operate in the context of seismic retrofitting (Council of Ministers decision no. 943, 2016). The project and construction management roles can be entrusted to:
- architects
- civil engineers
- surveyors or graduate surveyors (short degree)
- building experts, only if qualified and registered in their respective professional registers.

The surveyor, the graduate surveyor (short degree) and the building expert can only carry out the design and management of civil construction works of modest volume and size (maximum two floors above ground and limited volume).
The static testing of buildings in this context can only be carried out by architects and civil engineers who have been enrolled in the relevant professional register for at least 15 years.

The minimum requirements for the architect profile are:
- Three-year degree in architecture
- Application to obtain a license through several projects where you have assisted
- Registration in the relevant professional register.

The same background is required also for engineers.
The situation is different for qualified surveyors and building expert, who have to attend a technical high school diploma in one of the following fields of surveyor, environment and land construction, building expert, wood technician and geotechnical. Instead, the legal requirements for graduated surveyors are:
- Three-year university degree in Construction, Infrastructure Engineering or Territorial Information Systems

OR
- Specialized and master's degrees
- Application to obtain a license through several projects where you have assisted
- Registration in the relevant professional register.

In Albania, the choice of the technician in charge of project development, construction management and testing for seismic adaptation generally takes place by direct nominal call or through calls for tenders among professionals with the criterion of the maximum discount weighted by the minimum reference rates of the category. Engineers are usually preferred.
In general, there is a tendency to exclude the involvement of surveyors and building experts in the design of retrofitting interventions, because there are operational limits for this category.

The selection and hiring of technicians for the public administration generally takes place through public tenders that require simple degrees (degree), qualifications and in some cases also documentable experience in the sector for the various levels of responsibility and skills. In all cases, the resume of a professional who demonstrates continuous professional development through additional training is evaluated with a higher score.
In on-call job positions, a curriculum that goes beyond the bare minimum (simple qualification) is generally considered an important criterion. However, more than additional training and specific courses, greater importance is given to the experience accumulated by the professional in the field, in terms of years of experience, number of projects carried out and the technical complexity of the interventions.

In Croatia, the current legislation and technical regulations define the professional figures able to operate in the context of seismic retrofitting (NN 102/2020):

- architects
- civil engineers
- a certified mechanical engineer and a certified electrical engineer, if necessary.

The project of restoration of the building structure, depending on the method of restoration of the damaged building and the condition of the building, is made by a certified civil engineer who has at least five years of work experience in structural design and a certified architect who has at least five years of work experience, and a certified mechanical engineer and certified electrical engineer, if necessary.
In the case of a building reconstruction project which designs only the repair of the structure, the project may be made only by a certified civil engineer who has at least five years of work experience in the design of structures.
The building renovation project for the complete renovation of the building, depending on the method of restoration of the damaged building and the condition of the building, is made by a certified civil engineer with at least five years of experience in structural design and a certified architect with at least five years of experience plus an electrical engineer, if necessary.

The architect begins to perform general tasks immediately after completing studies, while a certified architect can perform tasks of all levels of seniority. For obtaining a certification, requirements are: appropriate education (Masters' degree), practical experience for at least 1 year, passed professional exam in accordance to relevant Act on Physical planning and Construction. There is a need for continuous vocational training, supervised by the Chamber of Architects which is in charge.

Similarly, the engineer begins to perform general tasks immediately after completing studies, while a certified engineer can perform tasks of all levels of seniority. For obtaining a certification, requirements: appropriate education (Masters' degree), practical experience for at least 1 year, passed professional exam in accordance to relevant Act on Physical planning and Construction. There is a need for continuous vocational training, supervised by the Chamber of Engineers which is in charge.

The qualified surveyor, graduate surveyor or building expert are able to perform general tasks immediately after completing studies.
In order to obtain such professional title, it is necessary to obtain an appropriate education, have the prescribed three years of practical experience and pass a professional examination for a certified engineer.

The professional title of certified surveyor in any phase can only be used by a person who is entered in the directory of certified engineers at the Croatian Chamber of Certified Geodetic Engineers.
Conditions for obtaining the title of certified surveyor:

- acquired appropriate education;
- practical experience gained in at least three years;
- an office in which a certified geodetic engineer performs professional geodetic works is entered in the appropriate register at the Chamber, i.e. if the legal entity in which he performs professional geodetic works is registered for performing activities;
- passed professional exam in accordance with the Architecture and Civil Engineering Act.

The choice of the technician in charge of project development, construction management and testing for seismic adaptation generally takes place by direct nominal call or through calls for tenders among professionals, with a preference for engineers.

When the client is a public administration, the following is desirable: relevant practical experience, appropriate education and knowledge in the field.
The selection and hiring of technicians for the public administration generally takes place through public tenders that require simple degrees (degree), qualifications and in some cases also documentable experience in the sector for the various levels of responsibility and skills. In all cases, the resume of a professional who demonstrates continuous professional development through additional training is evaluated with a higher score.
In on-call job positions, a curriculum that goes beyond the bare minimum (simple qualification) is generally considered an important criterion. However, more than additional training and specific courses, greater importance is given to the experience accumulated by the professional in the field, in terms of years of experience, number of projects carried out and the technical complexity of the interventions. However, given the recent strong earthquakes in Croatia, it is expected that additional specialized training will affect the future choice of contractors.

In Greece, the profiles able to design, supervise the works and carry out the testing of seismic retrofitting or retrofitting interventions of existing buildings are mainly civil engineers. In order for someone to be granted as an undergraduate student in a civil engineering program, exams at a Panhellenic level have to be taken. Once a student has finished the five years of studies and all predesigned subjects in a civil engineering curriculum, he/she has to take exams in order to achieve membership in the Technical Chamber of Greece. Once this membership is obtained, one engineer is ready for the freelance engineering in studying projects and/or construction projects.
Architects are educated in the relevant field in a similar manner as the one described for civil engineers, however they are not allowed to work as chief engineers in the field of structures. The purpose of their education is the eligibility of understanding and collaborating efficiently with civil engineers. Thus, their education is limited and not so extended as the one of civil engineers. Three post-graduate courses at public Universities offer additional specialization on the protection and restoration of cultural and historical monuments and building materials. All last for 3 academic semesters and are mainly addressed to engineers, however, one offered by the Technical Uni. of Crete is also addressed to archaeologists, historians, and material scientists. Two have fees and one is for free.

In Greece, in order for an engineer to be selected by public administrations, he has to choose either studying projects or constructing projects and enroll in the relevant lists of the Ministry of Infrastructures. In each case the engineer has to wait for an amount of time before being theoretically able to be awarded a government-related project. During this wait time which varies from two (2) years to five (5) years, one has to gain experience relevant to his/her goal field of expertise (studying or constructions). The enrolment in these lists is achieved through gathering and submitting relevant to the field of interest contracts and invoices.

In Italy, the current legislation and technical regulations define the professional figures able to operate in the context of seismic retrofitting (DPR 328/2001). The project and construction management can be entrusted to:
- architects
- civil engineers
- surveyors or graduate surveyors (short degree)
- building experts, only if qualified and registered in their respective professional registers.

The surveyor, the graduate surveyor (short degree) and the building expert can only carry out the design and management of civil construction works of modest volume and size (maximum two floors above ground and limited volume).
The static testing of buildings in this context can only be carried out by architects and civil engineers who have been enrolled in the relevant professional register for at least 10 years.

To be able to practice both as architect or engineer, in Italy, the legal requirements are:
- Five-year degree in architecture or engineering
- Qualification exam for practicing the profession of architect or engineer
- Registration in the relevant professional register.

The legal requirements for qualified surveyors and building experts are:
- Technical high school diploma in one of the following fields of surveyor, environment and land construction, building expert, wood technician and geotechnical,
- 18 months of internship at a design studio or alternatively an intensive six-month exam preparation course (on average 300 hours in total) organized by the register of surveyors,
- Qualification exam for the exercise of the profession,
- Registration in the relevant professional register.

Instead, the legal requirements for graduated surveyors are:
- Three-year university degree in Construction, Infrastructure Engineering or Territorial Information Systems;
OR
- Degree and 6-month internship in Architectural and Building Engineering Sciences, Building Sciences and Techniques, Urban Planning and Territorial and Environmental Planning Sciences or Civil and Environmental Engineering;
OR
- Specialized and master's degrees (pursuant to Miur decree n.509 of November 3, 1999 and n.270, 2004),
- Qualification exam for the exercise of the profession,
- Registration in the relevant professional register.

In Italy, the choice of the technician in charge of project development, construction management and testing for seismic adaptation generally takes place by direct nominal call or through calls for tenders among professionals with the criterion of the maximum discount weighted by the minimum reference rates of the category. Engineers are usually preferred.
In general, there is a tendency to exclude the involvement of surveyors and building experts in the design of retrofitting interventions, because there are operational limits for this category.
The selection and hiring of technicians for the public administration generally takes place through public tenders that require degrees, qualifications and in some cases also documentable experience in the sector for the various levels of responsibility and skills. In all cases, the resume of a professional who demonstrates continuous professional development through additional training is evaluated with a higher score.
As in the countries previously presented, in on-call job positions, a curriculum that goes beyond the bare minimum (simple qualification) is generally considered an important criterion. However, more than additional training and specific courses, greater importance is given to the experience accumulated by the professional in the field, in terms of years of experience, number of projects carried out and the technical complexity of the interventions.

In Serbia, Responsible Designer and Responsible Contractor perform the design, supervise the works and carry out the testing of seismic retrofitting or retrofitting interventions of existing buildings. According to the Planning and Building Act, article 128, professional tasks of drafting technical documentation in the capacity of responsible designer may be performed by a person with the professional title of a licensed engineer, licensed architect and licensed surveyor. According to the article 151 of the same Act, professional tasks of managing the construction of the facilities, i.e. execution of works in the capacity of a responsible contractor, may be undertaken by a licensed contractor (a person with acquired higher education in the professional field of architecture, civil engineering and geodesy).

The minimum requirement for an architect as building designer is to be registered in the register of licensed engineers, architects and spatial planners. The professional title of a licensed architect is obtained by issuing a license in the field of architecture. The licensed architect may be a person with a higher education in appropriate professional field, who has passed a professional practice exam and has at least three years of professional experience, and professional references in the field of practice. Instead, a licensed contractor may be a person with higher education in the professional field of architecture through academic studies, who has passed a professional practice exam and has at least three years of professional experience and professional references in the field. Alternatively, a licensed contractor may be a person with a higher education in the professional field of architecture through academic studies (shorter length), who has passed a professional practice exam, and has at least five years of professional experience, and professional references in the field of practice, i.e. the construction and execution of structures for which government-issued building permits are required. The structures being constructed include buildings which do not exceed eight floors in height (Basement + Ground floor + 4 floors + Attic), have total gross area of not more than 2000 m.sq., and/or less complex structures up to 12 m in length, local and uncategorized roads and streets, internal plumbing and sewage installations, heating and air-conditioning, electrical installations, internal gas installations, as well as the execution of interior design of facilities and landscaping.

Dealing with the profile of engineer and its different roles, the minimum requirements for engineer as responsible designer is the registration in the register of licensed engineers, architects and spatial planners. The professional title of a licensed engineer is obtained by issuing a license in the field of civil engineering. The licensed engineer may be a person with a higher education in appropriate professional field, who has passed a professional practice exam and has at least three years of professional experience, and professional references in the field of practice.

A licensed contractor, may be a person with higher education in the professional field of civil engineering through academic studies, who has passed a professional practice exam and has at least three years of professional experience and professional references in the field of practice. Alternatively, a licensed contractor may be a person with a higher education in the professional field of civil engineering through academic studies, who has passed a professional practice exam, and has at least five years of professional experience, and professional references in the field of practice, i.e. the construction and execution of structures for which government-issued building permits are required. As previously mentioned, the structures being constructed include buildings which do not exceed eight floors in height (Basement +Ground floor +4 floors + Attic), have total gross area of not more than 2000 m.sq., and/or less complex structures up to 12 m in length, local and uncategorized roads and streets, internal plumbing and sewage installations, heating and air-conditioning, electrical installations, internal gas installations, as well as the execution of interior design of facilities and landscaping.

A licensed surveyor is registered in the register of licensed engineers, architects and spatial planners. The professional title of a licensed surveyor is obtained by issuing a license in the field of geodesy, with a professional practice exam and at least three years of professional experience, and professional references in the field of practice.
A licensed contractor may be a person with higher education in the professional field of geodesy through academic studies, who has passed a professional practice exam and has at least three years of professional experience and professional references in the field of practice. Alternatively, a licensed contractor may be a person with a higher education in the professional field of geodesy of inferior length, who has passed a professional practice exam, and has at least five years of professional experience, and professional references in the field of practice, i.e. the construction and execution of structures for which government-issued building permits are required. The structures include buildings which do not exceed eight floors in height (Basement +Ground floor+4 floors + Attic), have total gross area of not more than 2000 m.sq., and/or less complex structures up to 12 m in length, local and uncategorized roads and streets, internal plumbing and sewage installations, heating and air-conditioning, electrical installations, internal gas installations, as well as the execution of interior design of facilities and landscaping.

In order to identify and choose the technicians for the design, execution and testing of seismic retrofitting works, the client considers the following qualifications: appropriate education, knowledge and experience, combined with the minimum number of the relevant professional references, plus the minimum fee. Engineers are usually preferred candidates.
When the selection procedure is performed by a public institution, it takes place through public procurement where appropriate education, knowledge and experience in the field need to be documented. Often, the selected candidate will be entering the internal staff of the public administration.
Clearly, a rich curriculum that goes beyond the minimum level required by law is raising the client's attention and can bring additional points in the selection criteria (both for public and private selections). Practical experience (extent and quality) has major influence on the selection of the professional, and it is quantified through the references and number of executed projects in the field.

In Slovenia, in order to design, supervise the works and carry out the testing of seismic retrofitting or retrofitting interventions of existing buildings, it is necessary to obtain a Bachelor degree (3 years of study) or master's degree (additional 2 years), sometimes also PhD (additional 3 to 4 years) is desirable. This applies in particular to the civil engineering profession. Some of these functions can also be performed to some extent by architects.
However, after obtaining the title at the 2nd level of study (Master), an engineer may take the Professional Exam for becoming a Certified Engineer/architect/urban planner.

The civil engineer and architect begin to perform general tasks immediately after completing his / her studies. The professional title of certified architect or certified civil engineer or certified urban planner can only be used by a person who is entered in the directory of certified engineers at the Chamber of Engineers of Slovenia (IZS). Conditions for obtaining the certification:

- Entry in the directory of certified:
  - acquired appropriate education
  - practical experience gained
  - passed professional exam in accordance with the Architecture and Civil Engineering Act
- Mandatory membership in the chamber
- Continuing vocational training: engineers must receive continuing vocational training in their field of expertise in accordance with the general act on continuing vocational training issued and supervised by the Chamber. Each year, the expert must collect the prescribed number of credit points, which he obtains through passive or active participation in training at ZAPS, IZS, professional and interest associations and other organizations in Slovenia or abroad and by writing professional papers.

Also, qualified surveyor ad graduate surveyor is able to perform general tasks immediately after completing his / her studies. In order to obtain the title of certified (graduate) surveyor, it is necessary to obtain an appropriate education, have the prescribed two years of practical experience and pass a professional examination for a certified engineer. The professional title of certified surveyor can only be used by a person who is entered in the directory of certified engineers at the Chamber of Engineers of Slovenia (IZS). Anyway, it is important to highlight that in Slovenia, the profile of the surveyor doesn't have the same meaning of the other countries considered: he/she is the professional, educated in the Faculty of Civil and Geodetic engineering, in charge of determining the terrestrial or three-dimensional positions of points and the distances and angles between them; therefore, this profile doesn't have the seismic skills and knowledge listed in the following paragraphs.

When it comes to the selection of the best candidate for the design, execution and testing of seismic retrofitting works, the client, in Slovenia, will choose the technician with appropriate practical experience, education and knowledge in this field. Instead, when the customer is a public administration, the technician must also have appropriate practical experience, education and knowledge in this field, but the conditions and criteria for selecting and hiring internal technicians are set for the public procurement. In the case of a public contract, depending on the amount of the contract, a certain number of tenders must be obtained. The one that is the most financially advantageous is collected from the bids that meet the required conditions. The technician expert in seismic field can be both an internal or external profile in the public body.

When it comes to the curriculum of the practitioner, the greatest advantage for selection is represented by practical experience and references. As far as research needs are concerned, supplementary training through postgraduate masters, PhD, specialization courses, update courses, seminars or conferences on the subject of seismic retrofitting really bring certain advantages.

Workers

Generally, in Albania we can identify two subgroups of workers directly involved in the operational processes typical of a seismic retrofitting site:
- skilled construction workers,

- foremen.

The main difference between the two subgroups consists in the organizational and managerial role of the foreman, who nevertheless remains a predominantly operational profile. There are no specific procedures for becoming skilled workers or foremen in seismic retrofitting sites.

In fact, usually, these profiles acquire specific experience for seismic retrofitting from on-the-job experience, gained in the context of construction companies that have participated in building renovation processes following earthquakes.

Currently, there are no specific training in seismic retrofitting for workers but, there are some courses organized in Albania by CHwB (Cultural Heritage without Borders) or the National Institute of Monuments that focus on architectural restoration.

The workers involved in seismic retrofitting sites can have different qualifications, such as:

- professional qualification as a construction operator,
- diploma of surveyor
- construction technician and environment, territory and building expert.

In Croatia, the work on seismic retrofitting sites is done by qualified and trained masons with high-school diploma. There are no specific procedures for becoming skilled workers or foremen in seismic retrofitting sites. Usually, these profiles acquire specific experience for seismic retrofitting from on-the-job experience gained in the context of construction companies that have participated in building renovation processes following earthquakes.

The construction manager can be a person who: has at least eight years of work experience in relevant jobs with education in the field of architecture, civil engineering, electrical engineering or mechanical engineering, who has completed Masters' university studies, or who has otherwise acquired the appropriate level of education and who has the necessary knowledge in the field of construction management.

Concerning the existence of specific training courses in the field of seismic retrofitting, certain private companies organize practical seminars on the application of materials, on a non-regular basis.

To reach the profile of qualified construction worker, the minimum requirements are three-year high-school and passing of end-of-high-school exam or completed a retraining program for a qualified construction worker.

In Greece big companies which produce construction materials, educate for the use of their company products towards reinforcement of structures.

Anybody with a good interest in relevant subjects may join them. Hence, there is no minimum period of experience in the field of constructions, as prerequisite of participation.

Generally, in Italy we can identify two subgroups of workers directly involved in the operational processes typical of a seismic retrofitting site:

- skilled construction workers,
- foremen.

The main difference between the two subgroups consists in the organizational and managerial role of the foreman, who nevertheless remains a predominantly operational profile.

In Italy there are no specific procedures for becoming skilled workers or foremen in seismic retrofitting sites.

Usually, these profiles acquire specific experience for seismic retrofitting from on-the-job experience gained in the context of construction companies that have participated in building renovation processes following earthquakes.
The main supplier of training for workers in the field of seismic retrofitting are Vocational centers in the construction sector, as well as companies producing materials for seismic consolidation interventions.
Specifically, in Italy, Vocational training centers in the construction sector provide training courses in the field of seismic retrofitting addressed to both workers (bricklayers, construction operators, etc.) and foremen.

Among the training providers in the field of seismic retrofitting, companies producing materials and systems for structural reinforcement, seismic improvement and adaptation play a relevant role in the training of construction company workers. Here are some names of the companies most present in Europe: Kerakoll, Ytoung, Fibra Net, Mapei, Saint-Gobain-Weber, Fassa Bortolo, etc.
These companies frequently organize specific training courses, aimed at acquiring the skills necessary to correctly apply the materials and systems for the structural reinforcement of buildings damaged by the earthquake. The courses are addressed to construction company workers engaged in seismic retrofitting activities.

The workers involved in seismic retrofitting sites can have different qualifications, such as:

- professional qualification as a construction operator,
- diploma of surveyor,
- construction technician and environment, territory and building.

In Serbia, generally, the work on seismic retrofitting is done by highly qualified workers (mostly masons). In most cases they are not specifically educated for seismic retrofitting interventions.

There is no specific procedure to become either a skilled worker or a foreman for seismic retrofitting projects, because seismic retrofitting skills are not taught in technical schools; instead the training is performed during construction, within the projects of building reconstruction. Recently, some companies that supply materials for retrofitting, have started to organize seminars where workers can learn specific procedures. For instance, companies like SIKA and Mapei, which manufacture specific construction materials for seismic retrofitting, organize practical seminars with the instruction on proper application of their products.

To become project manager at construction sites, many years of practice and appropriate professional exams are required.
Skilled construction workers are required to have education at the high school level (technical school) and usually work as masons, carpenters, or general construction workers.

In Slovenia, usually, the work on seismic retrofitting sites is done by highly qualified classically trained masons. The procedures used in the reinforcement of buildings / structures are not learned in details by the workers in the masonry school, but later, through practice, on the basis of cooperation with older, experienced workers. Workers learn certain procedures in practical seminars prepared by suppliers of retrofitting building materials.

Project management of construction sites requires many years of practice, appropriate education and professional exams.

Dealing with specific professional training courses for workers of seismic retrofitting sites, it has been already mentioned that some companies, from which specific construction materials intended for rehabilitation and consolidation are purchased, organize practical seminars on the application of these materials.

In order to leave it to the worker to carry out retrofitting and consolidation interventions on buildings, this profile needs a vocational school of construction, the most suitable profile is a mason. However, as there is a shortage of such workers on the market, occasionally are also hired workers with related profiles, who, however, need more time to learn.

Civil servants

In Albania, when considering only non-technician profiles in public administration, it is possible to find different profiles such as geologists, chemists, environmental and territorial technicians, archaeologists, computer scientists, etc.
Our attention is focused specifically on the employees of public bodies who have decision-making or economic responsibilities but do not have a technical training background, such as:

- accountants and administrative staff
- experts in legal procedures
- financial managers.

These categories of employees are responsible for defining: the decision-making and financial procedures, the economic definition of intervention projects, the bureaucratic process for project approval, the definition of public procurements, the selection of professionals, commissioning, etc.
Such institutions can be further clustered as Municipalities, Local Councils, the National Institute of Monuments, etc., and their respective personnel which is potentially interested in having a broad knowledge regarding seismic retrofitting.
For these profiles, the minimum academic qualification required are usually, accounting diploma or university degrees such as economic science, political science, accounting, financial sciences, law, etc.
Apprenticeships, internships or practical training periods are not mandatory.
Regional/local authorities organize specific seminars or training sessions for their employees who deal with safety and other generic topics linked with seismic events and assessment. There are no training sessions or courses organized in Albania, after the 2019 Earthquake, at the present.

In Croatia, in this target group are included various employees at the local and national level. These are e.g. the employees of public bodies who have decision-making or economic responsibilities but do not have a technical training background, such as:

a. accountants and administrative staff
b. experts in legal procedures
c. financial managers.

The placement of staff local/regional/national authorities' administrations is performed through public tender.
Important non-technical services in the event of an earthquake also include: professional forces (fire brigades, emergency medical care, the police, the army), Croatian Mountain Rescue Service, Croatian Red Cross.
These profiles should be familiar with the current relevant legislations and legally defined documents dealing with civil protection. It is desirable to have basic knowledge of project financing, project management, tax

breaks and possible deductions for the seismic retrofitting, but also, knowledge of the organizational models and procedures of the civil protection service.
Specific trainings for civil servants participating in activities related to seismic retrofitting are regularly organized.

In Greece, several organizations and companies educate their members or their employees towards primary earthquake control of private buildings, public buildings and buildings of public use. There is a high possibility that they teach Civil Servants as well preparing them for eye checks after severe earthquakes through filling a form of "yes", "no" questionnaires. Additionally, they teach Civil Servants other techniques or methods of dealing with disasters, such us gathering points, organized provision of food and tents etc.
There do not take place qualification exams, no license is required or given after the seminars are concluded. However, for being eligible for this kind of seminars you have to be a prominent member of the technical services department of your civil servants' body. If you work for the private sector, there is a good chance you belong to the public works constructor's association and you are interested in getting acquainted with this field.
Hence, there is no minimum period of experience in the field of constructions as prerequisite of participation. It is noted that of all aforementioned bodies only the General Secretariat for Civil Protection teaches participants how to implement restoration based on theoretical knowledge.
The Earthquake Planning and Protection Organization (OASP) contributes to the operational preparedness for an earthquake of the Local Governments by providing guidelines and planning a series of actions related to the operational planning of emergencies in case of an earthquake. In this context, it cooperates with Civil Protection executives of the Decentralized Administrations, Regions and Municipalities, as well as with representatives of stakeholders at central, regional and local level.

The Ministry of Infrastructure and Transport, General Secretariat of Infrastructure, General Directorate of Disaster Impact Rehabilitation (GDDIFR) provides consultancy when needed by
a. participating in the two-member committees, which are formed under the responsibility of their supervisor, to determine the suitability for use of the buildings (Primary and Secondary Inspection).
b. participating in the three-member building control committees, which are formed under the responsibility of their supervisor, for the compilation and issuance of their characterization conclusion, and they compile and issue the Autopsy Protocol for Dangerously Destroyed Buildings.
c. controlling the ongoing operations of the Rehabilitation Sectors that fall within their territorial jurisdiction.
d. Making the payments related to the restoration project within the framework of their responsibilities.
e. Implementing the rehabilitation project in cases where no Sector has been established at the scene.
In addition, they Educate relevantly Civil Servants. However, for being eligible for this kind of seminars you have to be a prominent member of the technical services department of your civil servants' body.
Hence, there is no minimum period of experience in the field of constructions a prerequisite of participation.

In Italy, if we exclude technical personnel (such as engineers, architects and surveyors that we include in the target of practitioners), in the public administrations it is possible to find different profiles such as geologists, chemists, environmental and territorial technicians, archaeologists, computer scientists, etc.
As already underlined, Adriseismic attention is focused specifically on the employees of public bodies who have decision-making or economic responsibilities but do not have a technical training background, such as:

- accountants and administrative staff
- experts in legal procedures

- financial managers

The institutions that we have taken as reference and analyzed are:

- the Emilia Romagna Region, in which there are multiple structures, sectors and departments that manage problems related to earthquake and seismic risk. Some examples are indicated below:
    - Regional Agency for Reconstruction - Sisma 2012
    - Service for The Technical Management of Reconstruction Interventions
    - Regional Agency for Territorial Security and Civil Protection
    - Technical Policy and Civil Protection Service
    - Territorial Security and Civil Protection Service of all the Provinces of the Region
    - Ibacn - Institute for Artistic, Cultural and Natural Heritage
    - Directorate-General Care of the Territory and the Environment
    - Geological, Seismic and Soil Service
    - Territory Legal Service, Construction Regulations, Safety and Legality
    - Territorial and Urban Planning, Transport and Landscape Planning Service
    - Urban Quality Service and Living Policies
    - Impact Assessment and Environmental Sustainability Promotion Service
    - Cultural Heritage Service
    - Council for The Environment, Soil and Coast Defense, Civil Protection
    - Commission Ii - Economic Policies
    - Commission Iii - Territory, Environment, Mobility

Other institutions which have been considered are the Provinces and the Municipalities. Also, in these organizations there are departments and sectors that manage issues related to seismic retrofitting and seismic risk at a local level.

For the considered profiles, the minimum academic qualification required are, usually, accounting diploma or university degrees such as economic science, political science, accounting, financial sciences, law, etc.

Apprenticeships, internships or practical training periods are not mandatory.

During the first step of the context analysis we have discovered that regional/local authorities often organize specific seminars or training sessions for their employees who deal with safety and other generic topics linked with seismic events and assessment.

For instance, the Emilia Romagna Region organized several courses and seminars promoted by the Geological Seismic and Soil Service on the subject of design, execution and control of structural interventions.

In 2019 and 2018, training events on the design, execution and control of structural interventions in Emilia's post-2012 earthquake reconstruction were organized.

In 2017, a conference was organized to promote the safety of the existing building heritage and the relaunch of the construction sector in Emilia-Romagna with a specific focus on incentives for the reduction of seismic risk.

In **Serbia**, employees with non-technical background in public administrations are accountants, administrative staff, economists, experts with the background in finance sector, management and law. For these profiles, usual education requirements are accounting diploma or university degrees in political science, accounting, finance and law etc. Experience and knowledge from the field of construction regarding economical and legal issues are beneficial.

Basic knowledge is acquired through high school and university level education. Besides this, various courses from the field of administration, finances and legal procedures are offered. Nonetheless, so far there is no

obligation for civil servants to take part in specific training and updating courses/events in order to manage seismic retrofitting activities, which can be explained by the lack of such activities at the present time.

In Slovenia, the most common non-technical civil servant profiles are e.g. administrative staff in municipalities, ministries (Ministry of Culture, Ministry of Environment and Spatial Planning, Ministry of Defense - Administration of the Republic Slovenia for Protection and Rescue...). It is recommended that such profiles (depending on the field of work) are familiar with the current building legislation and the regulation relating to spatial interventions and the management of cultural heritage as well as administrative procedures. They must be familiar with all valid legally defined documents dealing with civil protection (both prevention and curative).
Other desirable experiences: basic knowledge of local construction techniques and seismic strengthening techniques of buildings, basic knowledge of seismic assessment and seismic adaptation of historic buildings; project financing, project management, tax breaks and possible deductions for the seismic retrofitting; knowledge of the organizational models and procedures of the civil protection service; knowledge of the organizational models and procedures of the civil protection service.

Other category of civil servants acts as professional and duty forces (National Guard) in the field of protection and rescue. Most people are not fully employed in civil protection forces (except of officials and professionals within the Administration of Republic of Slovenia for Protection and Rescue mentioned in the paragraph above). These are duty forces and are called up when rescue and protection can't be performed by professional or voluntary forces.

Some basic skills to reach these profiles are acquired in the formal part of education (secondary school, high school, faculty). The remaining skills are acquired through work experience and through various courses (usually daily / several-day courses). There are few courses that people with such a profile attend. Some are done only once, and some need to be renewed.

2.2 Comparative matrix

After the in-depth analysis for each of the countries involved in the project, IIPLE has also tried to compare some of the most relevant and interesting aspects emerged by the research.

	Greece	**Slovenia**	**Serbia**	**Albania**	**Croatia**	**Italy**
Practitioners						
Which are the professional figures who can design, supervise the works and carry out the testing of seismic retrofitting or retrofitting interventions of existing buildings?	Civil engineer; the profile of architect is trained for eligibility of understanding and collaborating efficiently with civil engineers.	Architect, civil engineer, restorer.	The 2 profiles are Responsible Designer and Responsible Contractor. These tasks may be performed by licensed engineer, licensed architect and licensed surveyor. Professional tasks in the capacity of a responsible contractor, may be undertaken by	Architect, civil engineer, qualified surveyor, graduate surveyor.	Certified civil engineer who has at least five years of work experience in structural design; a certified architect who has at least five years of work experience.	Architect, civil engineer, qualified surveyor, graduate surveyor, building expert, geologist, restorer; surveyor, graduate surveyor, building expert only design and manage construction work of modest size.

			a person who has been licensed contractor (a person with acquired higher education in the professional field of architecture, civil engineering and geodesy)			
Requirements for qualified and graduate surveyor?	Only university degree plus exams in order to achieve membership in the Technical Chamber of Greece.	No distinction between the 2 profiles; university degree, 2 years of practical experience, professional exam and inscription to professional register.	The title of qualified surveyor is obtained by issuing a license in the field of geodesy. For the graduate surveyor the requirements are higher education in the professional field of geodesy through academic studies, professional practice exam and at least three years of professional experience and professional references in the field of practice.	High school technical diploma and practical experience for qualified surveyor; university degree, professional exam and inscription to professional register for graduate surveyor.	Three years of practical experience and pass a professional examination for a certified engineer.	High school technical diploma and practical experience for graduate surveyor; university degree, professional exam and inscription to professional register
How is performed the selection of professionals for public institutions?	The practitioners should enrol in relevant lists of the Ministry of Infrastructure for at least two years, to acquire experience.	Public tender; the most economically convenient solution is selected, together with the condition of appropriate education; relevant practical experience and knowledge in the field considered.	For both roles the selection and hiring of internal technicians for the public administration takes place through public procurement where appropriate education, knowledge and experience in the field need to be documented.	Public tender; the most economically convenient solution is selected. Additional specific training are evaluated with higher score.	By direct nominal call or through calls for tenders among professionals, with a preference for engineers.	Public tender; the most economically convenient solution is selected. Additional specific training are evaluated with higher score.
How much does it count to have additional and specific training or certificates in the cv?	Experience is very important both for the studying but also implementation phase. In each case the License for Implementing either the Research or Construction activities has several grades,	Experience (years of activity on the job, complexity of intervention performed) has a major weight in the selection phase.	Practical experience (extent and quality) has major influence on the selection of the professional, and it is quantified through the references and number of executed projects in the field.	Greater importance is given to the experience accumulated by the professional in the field, in terms of years of experience, number of projects carried out and the technical	Relevant practical experience in the field, appropriate education and knowledge in the field in question.	Experience (years of activity on the job, complexity of intervention performed) has a major weight in the selection phase.

	each depending on the years of experience on the topic. For certain projects, certain grades are required.			complexity of the interventions.		

The comparative matrix highlights a similar scenario in all the countries considered: the profiles that are able to design and supervise the seismic testing of a building or a retrofitting project are mainly civil engineers and, in some cases, architects. The profile of surveyor and building expert are not common to all the Partners.
In all the countries, the selection of a practitioner for working as external or internal technician in a public administration is performed by public tender. In Greece, instead, the professional should enroll, for at least 2 years, in the list of the Ministry of Infrastructure, before being selected.

	Greece	**Slovenia**	**Serbia**	**Albania**	**Croatia**	**Italy**
Workers						
How to become skilled worker in seismic retrofitting sites?	Only high worker profiles, with several years of experience.	Only high worker profiles, with several years of experience.	Generally, the work on seismic retrofitting is done by highly qualified workers (mostly masons). In most cases they are not educated specifically for seismic retrofitting interventions.	Worker profile with several years of experience in seismic interventions.	Worker profile with high-school diploma and on-the-job experience gained in the context of construction companies that have participated in building renovation processes following earthquakes.	Worker profile with several years of experience in seismic interventions.
Procedure to become a foreman/construction manager in seismic retrofitting sites?	No specific procedure, it's a profile acquired through experience.	Appropriate education, several years of experience and professional exam.	There is no specific procedure to become either a skilled worker or a foreman at seismic retrofitting sites, because seismic retrofitting skills are not taught in technical schools, but at the construction site).	Specific experience for seismic retrofitting from on-the-job experience gained in the context of construction companies that have participated in building renovation processes following earthquakes.	At least eight years of work experience in relevant jobs with education in the field of architecture, civil engineering, electrical engineering or mechanical engineering, who has completed Masters' university studies.	No specific procedure, it's a profile acquired through experience.
Existence of specific professional training courses for workers of seismic retrofitting sites?	Yes, organized by big companies providing construction materials for reinforcement of structures. No certificate.	Yes, organized by big companies providing construction materials. Some of these courses also provide a certificate.	Companies that manufacture specific construction materials for seismic retrofitting organize practical seminars with instruction on	No specific trainings. But there are some courses organised big companies (CHwB) or the National Institute of Monuments that focus on architectural restoration.	Private companies organize practical seminars on the application of materials, on a non-regular basis.	Yes, organized by big companies or VET centres.

			proper application of their products.			

What emerges from the comparative analysis for worker profile, is that the general and specific skills are not acquired by training but thanks to on-the-job experience. Only construction workers with several years of experience, are entitled to perform seismic measurements on site. Nonetheless, several companies, leader in the production of construction materials and implants, organize specific training for workers of the sector.

Moreover, no specific procedures to become a foreman or construction manager seems to exist in the 6 countries involved in Adriseismic Project. Instead, in these countries, many big companies that produce specific construction materials for seismic retrofitting, organize training courses for teaching its correct use and procedure.

	Greece	**Slovenia**	**Serbia**	**Albania**	**Croatia**	**Italy**
Civil servants (non-technical)						
Which are the interested profiles?	Member of public bodies and organization.	Administrative staff and civil servants in the field of rescue and protection.	Accountants, administrative staff, economists, experts with the background in finance sector, management and law.	Accountants and administrative staff, experts in legal procedures, financial managers.	Accountants and administrative staff, experts in legal procedures, financial managers.	Accountants and administrative staff, experts in legal procedures, financial managers.
Required qualifications and experiences for these profiles, in order to operate in the field of seismic retrofitting?	Must be a member of technical service department of civil body.	For administrative stuff: formal part of education (high school, faculty) and it is also recomended that they are familiar with additional knowledge in their own field Administrative procedures, building legislation, regulation of spatial intervention . Desirable knowledge in local construction techniques and seismic strengthening techniques of buildings, seismic assessment and adaptation of historic buildings; project financing, project management, tax breaks and possible deductions for the	Accounting diploma or university degree (political science, law, economic science). Knowledge in the specific sector are a plus.	Accounting diploma or university degree (political science, law, economic science). No required knowledge in the specific sector.	To be familiar with the current relevant legislations and legally defined documents dealing with civil protection. It is desirable to have basic knowledge of project financing, project management, tax breaks and possible deductions for the seismic retrofitting.	Accounting diploma or university degree (political science, law, economic science). No required knowledge in the specific sector.

		seismic retrofitting. For civil servants in the field of rescue and protection: knowledge of the organizational models and procedures of the civil protection service.				
Specific trainings required?	Training to prepare these profiles to check a building after a severe earthquake (organized by Ministry of transport and infrastructure).	For civil protection forces: mandatory trainings and updating courses organized by the government.	No obligation for civil servants to take part in specific training and updating courses/events to manage seismic retrofitting activities.	Usually training courses organized by regional or local authorities, but no courses after 2019 earthquake.	Non-regular training and seminars online or in-situ, provided by different authorities and Chambers, academic institutions and other, such as Croatian centre for seismic engineering.	Regional/local authorities organize specific seminars or training sessions for their employees who deal with safety and other generic topics linked with seismic events and assessment.

When talking about non-technician civil servants, the profiles considered are accountants and administrative staff of public administrations, experts in legal procedures, financial managers. The required training background is usually high school diploma or university degree in political science, economics, law etc.

The situation highlighted by the partners reveals the absence of adequate training programmes on seismic retrofitting, for non-technician profiles in public administration. This gap should be addressed as soon as possible, in order to increase their range of responsibilities and activities.

3 Analysis of the existing training offer in the field of seismic vulnerability and retrofitting

As anticipated in the previous paragraph, the first step of the WP has been the collection of all best practices about training and the identification of current university, post university and professional educational courses currently in place in each involved Country. The aim of this first task was to define the current educational offer considering all the figures and assets involved, and to compare it with the necessary skills for dealing with seismic vulnerability assessment and reduction. This gap analysis, concerning current training programmes and educational needs, should pave the way for defining new learning opportunities in the involved Regions. In each Country, the organizations involved in training courses and educational curricula (e.g., universities, professional training institutions) have been identified, as well as all the figures to be trained.

After a first comparison[2], the situation depicted in Figure 3-1 emerged:

COUNTRY	UNIVERSITIES	HIGH SCHOOLS	PUBLIC ENTITIES	PROFESSIONAL ORDERS	VET CENTRES	PRIVATE ASSOCIATIONS/COMPANIES	TOTAL
ALBANIA	5		1			1	**7**
CROATIA	10	14		1	2	6	**33**
GREECE	15		4	2		4	**25**
ITALY	18	1	4	12	7	26	**68**
SERBIA	6	16	2	1		2	**27**
SLOVENIA	8	10	3	5	4	3	**33**

Figure 3-1 Training providers for partners countries

The first interesting aspect to consider is the fact that in some countries the training offer for experts in the field of seismic vulnerability is extremely poor when compared to the other partners. In Albania, for instance, the training providers in the specific sector considered are only 7, mostly connected with academic institutions. Instead, in Italy, most of the specific and technical training in the seismic field is provided by private training centers or schools and enterprises connected to the construction sector.

Generally speaking, in most of the countries considered, the universities (both public and private) offer a consistent number of courses and programmes dealing with seismic vulnerability and retrofitting; clearly, this offer is not directed to all the target groups involved in Adriseismic project.
Another surprising aspect deals with the fact that private associations and companies are not actively involved in specific training linked with the topic of seismic retrofitting. There are few exceptions, as highlighted by the research: for instance, in Greece, Serbia and Italy, there are big companies that are aware of the importance of training and updating of the knowledge of their employees, and periodically they plan webinars, training courses for professionals and workers.

Hereafter are listed and analyzed the training programmes identified for each country, and the most relevant aspects are highlighted and examined.

3.1 Albania

The team of the Albanian partner (City of Gjirokaster) has identified 7 training programmes, and most of them are provided by universities. The curricula (attached as annex of this deliverable) are:

- a 5-months post-graduate professional course on traditional building techniques, addressed to practitioners, post-degree candidates and university students;
- 5 university degrees in architecture, civil engineering and construction engineering;
- a 10-hours anti-seismic design course which proposes the study of the main topics of seismic legislation, from material modeling, methods of structural analysis and verification of works, through the semi-probabilistic and limited method, to the sustainability criteria.

[2] It is important to highlight that for Italy, the number of high schools providing seismic contents is much higher: more than 2000 schools provide these general knowledges but we have decided to signal only 1, in order not to distort the overall results. The same comment can be provided for Greece where, considering seismic contents, all high schools training under several courses (Geography, Natural Environment, etc), and every year all schools, from primary to high, are performing two evacuation drills due to EQ.

3.2 Croatia

The Adriseismic partner from Croatia (Grad Kastela), has identified 33 training programmes in the field of seismic vulnerability.

In the first category the team has identified 12 technical high school diploma programmes for several target profiles, mainly bricklayers and construction technicians. In the field of academic training, 5 other university curricula have been collected and described: the master degrees deal specifically with geotechnics, construction, architecture and urbanism, load-bearing structures.

In the category of specific training lasting from 100 to 600 hours, 13 training programmes have been analyzed: the providers are vocational education training centers, public or private schools, institutes for adult education. The range of topics covered by the courses is wide and includes load-bearing elements, mezzanine structures, repair, adaptation and maintenance of buildings, field construction and renovation, planning, preparation, design and construction of buildings. The contents of these programmes is to retrain professionals, by updating and increasing their skills and knowledge.

Finally, the Croatian partner has identified 3 training programmes organized by private entities, 2 big companies and the Croatian Chamber of civil engineering. The last one is extremely interesting as it is addressed to seismologists, architects and constructors and deals specifically with the seismic field: comprehensive understanding of earthquake risk issues, with a close focus on the reconstruction of Zagreb and Petrinja.

3.3 Greece

The two Greek partners (University of Crete -UoC and Region of Crete - RoC) have collected a total of 25 training forms; 9 under graduate programmes are provided by universities and are mostly curricula degree for civil engineers and architects, whereas 3 post-graduate programmes are offered by universities on protection and restoration of cultural and historical monuments and building materials. The other forms, instead, have been developed for civil servants and employees of public entities or organizations. The training method is a 5-hours seminar on specific topics and practical skills. As organized directly by the employers of technicians and civil servants, these training courses often don’t have inscription fees.

In specific, the courses that have a focus on the topic of seismic vulnerability deal with:

- Primary earthquake control of public buildings and methodologies to implement restoration (10 seminars),
- Educating to the correct use of reinforcement of structures (2 seminars),
- Suitability for use of buildings, Autopsy Protocol for Dangerously Destroyed Buildings, rehabilitation, payment for restoration projects (1 seminar).

3.4 Italy

IIPLE and UNIBO have analyzed the Italian context and identified 51 training programmes, the most relevant in the seismic field. In the first category, 3 curricula provided by universities are presented: the degree in Civil Engineering for Mitigation of Risk from Natural Hazards, the degree in Engineering for natural risk management and the Degree in science of exploration and applied geophysics. 5 post-graduate masters are

also provided by 5 different universities and deal with topics specifically connected with seismic hazard and risk: seismic design of structures for sustainable buildings, seismic improvement, restoration and consolidation of the historical and monumental building, analysis and assessment of seismic risk, post catastrophe technical administrative management in local bodies. A more detailed insight on the topics and contents covered is included in the annexed schemes.

In the category of specific training lasting 100-600 hours, the team has identified 2 courses (provided by training centers) on anti-seismic structural engineering and diagnostics, on structural verification of historical and monumental buildings. The first one is targeted to engineers and architects, the second one to professionals and administrators.

6 training programmes of medium-term length (30-100 hours) have been considered too in this research: one is provided by a local order of engineers, while the others are organized by local or regional training entities. Some of the courses are free of charge, as they have received funding by a regional financing programme. The main topics discussed are: the technical management of the seismic emergency, the survey of the damage and evaluation of the seismic viability; seismic design techniques and static testing of structures for sustainable constructions; anti-seismic construction techniques; techniques for the assessment of seismic risk and environmental impact in existing structures; seismic analysis of buildings.

In the category of theoretical and practical training of anti-seismic products and techniques (30 hours of duration maximum) have been included 10 different courses targeting surveyors, engineers, architects, industrial experts, employees of construction companies who have to deepen their knowledge on specific subjects. The average length of the courses is 18 hours because the programmes are limited to specific contents with a high level of detail. When talking about periodic updating courses, 3 other programmes with an inferior length have been identified; as the duration is of only 8 hours, the courses have an extremely high level of focus:

- earthquake safety management for RSPP (Security, Prevention and Protection Responsible) or DDL (employer) or RLS (Workers Representative for Security),
- assessment of seismic risk in working environments (regulatory, legal and technical aspects) for corporate RSPP, business consultants and employers,
- seismic vulnerability analysis of buildings and viability checks following a seismic event for professionals.

Finally, the Italian team has identified 22 specific FAD (distance learning) or E-learning training in the field of anti-seismic methods and materials. All these courses have been organized and provided by private training institutes and centers and are targeted to different groups of professionals. Of course, the topics and contents discussed cover a wide range of fields; for additional information, the description is attached at the end of the deliverable.

3.5 Serbia

RDA Backa, the Serbian partner of Adriseismic project, has collected a total of 44 training programmes.

First of all, they have identified and collected information on technical training curricula, provided by national high schools; after the examination of contents and subjects, it appears that none of these 18 programmes provides specific training in the field of structural consolidation and restoration. In the academic sector, 4

different universities provide 7 courses on civil engineering, with specific subjects dealing with earthquake engineering.

The partner has also identified a workshop (held in 2019), organized by the Serbian Association for Earthquake Engineering, GEM Foundation and EUCENTRE under the HORIZON 2020 SERA Projects and targeting its own members and academics from Balkan countries. During this event (lasting 3 days) the participants have discussed several topics:

- Seismic risk-related research in Balkan countries,
- Balkan exposure model: methodology and status,
- Risk assessment and mitigation initiatives in Balkan countries,
- Relevant issues related to seismic risk mitigation in Europe.

Moreover, 18 seminars, conferences and informative events have been identified and listed in the specific category: most of these events have been organized by the Association of civil engineers, geotechnical engineers and town planners "Izgradnja", by the Serbian chamber of engineers, the already mentioned Serbian association for earthquake engineering and two big companies of the construction industry. The information sheets of these events, mainly targeted to engineers, are attached at the end of the deliverable. It is interesting to underline that 7 of these events refer to the same conference, the Fifth International Conference: „Experiences and Lessons Learned after November 11, 2010, Kraljevo Earthquake". The other events and conferences deal with seismic retrofitting and strengthening, even if this is not the main topic discussed.

3.6 Slovenia

The training programs identified by the Slovenian partner (ZAG), are divided into 9 categories and are, in total, 74. Of course, the partner has selected only the most relevant and pertinent for the purpose of the project. The technical sheets are attached at the end of this deliverable.

Before describing the characteristics of the training programs identified, it is necessary to underline that the academic formal system in Slovenia is different from the one in the other countries considered: the school years from 15 to 19 are considered "secondary schools" whereas the 3 years degree is called "high school". In the following paragraphs, this peculiarity has been maintained.

Formal education in Slovenia: In the first group there are 10 secondary schools in which construction workers are educated. Second group includes 3 universities where civil engineers and architects are educated. After the completed study they get the title Bachelor, Master or PhD. There are also 4 high schools for "first degree" civil engineers (2 or 3 years of study) and 3 universities for Master study of conservators and restorers.

In the third group trainings for people in the field of rescue and protection forces (professional forces, national guard and voluntary forces) are described.

- A single training program for firefighters is organized by a Fire school and Training center for civil protection and it is aimed specifically at professional firefighters. Because of its relevance and wide range of topics discussed, it has a length of 810 hours. Specific medium term (30 - 100 hours) training and includes 11 courses, all organized by the Fire school and training center for civil protection, with the exception of a 70 hours programme provided by the Red Cross and targeted to members of first aid teams. These programmes have the objective to transmit specific information on the system of

protection against natural and other disasters, both in the natural environment and urban context. The main targets are firefighters, members of first aid and rescue teams, operators of the Slovenian Army and Police.

The section "Theoretical and practical training of anti-seismic products and techniques" includes 32 training programmes of 30 hours maximum intended for the training of civil servants in the field of the protection and rescue forces. The topics covered and the total length of these curricula vary widely. In this category, 4 courses deal in specific with the field of seismic risks:

- A program of introductory and basic training for members of commissions for the assessment of buildings' damage (21 hours),
- a supplementary training program for members of commissions for the assessment of buildings' damage (8 hours),
- a training program for the members of damage assessment commissions in the event of natural and other disasters (12 hours).
- A two-day meeting with various topics including civil engineering and seismic topic (16 hours).

- The workshop category is made up of 1 program for: the members of commissions for assessing damage of buildings during earthquakes and other disasters, which is developed as a supplementary training of 8 hours, to update knowledge of civil protection forces.
- The 4 training courses on specific skills in the field of protection and rescue forces are also organized by the Fire school and training centre for civil protection but the duration is reduced as these are considered as periodic updating classes.
- A specific category has been devoted to the training courses for technical preparation of civil service volunteers in the field of protection and rescue forces; the 7 programs identified have a length of 20-30 hours, are totally free of charge for the participants and are organized by the Fire school and training centre for civil protection.

Fourth group is training in the form of different workshops addressed to practitioners and workers is organized by manufacturers of construction equipment, machinery and building materials; this are more technical programs, dealing with innovation in building materials and techniques.

The Slovenian partner has also selected some of the most relevant seminars and conferences held in the last years, dealing with the Construction sector (fifth group). These 6 events have been organized by different actors: the Chamber of engineers, the Chamber of crafts and small business, the Slovenian association of civil engineers and the Association of Civil Engineers and Technicians of Slovenia.

3.7 First evidence

The analysis conducted and the evidence encountered have been presented with the aim to highlight the gaps between the topics and contents covered by training (in the 6 countries involved in the project) and the knowledge and skills that professionals, workers and volunteers should possess in order to operate in seismic interventions. With the aim of comparing the prerequisites and the training offer for the 4 target groups considered, the consortium of Adriseismic has identified and listed the competences for workers, technicians and administrative and has asked, during local events with stakeholders, to validate and comment these lists.

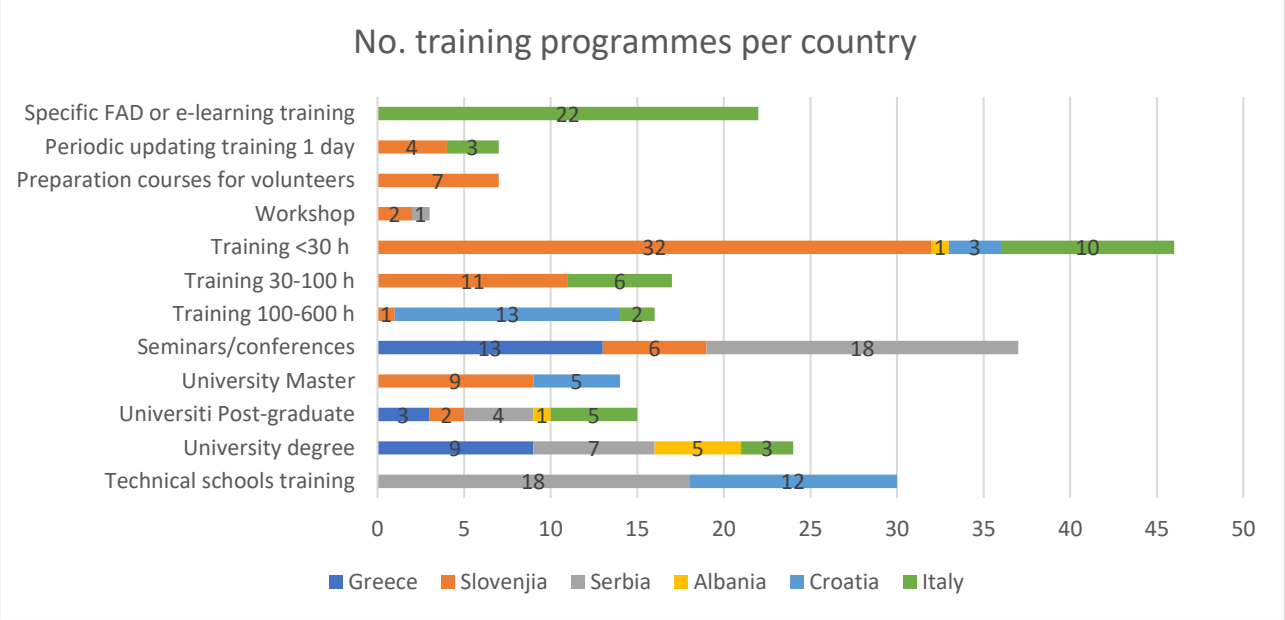

Figure 3-2 Number of courses including seismic topics, collected by partners in each category

The figure above graphically shows the quantitative work analysis performed by the Adriseismic consortium; the situation in the 6 countries varies noticeably: some countries have few trainings offers which include the field of seismic intervention, whereas some others have a relevant number of available courses but only in some of the listed categories.

This analysis has therefore confirmed the premise from which the project has been developed: the academic and technical training offered in the countries involved in the investigation is insufficient; there are few specific programmes addressing the topic of seismic vulnerability and the different methodologies to implement in order to prevent and solve seismic hazards and disasters. From these lacks originate the gaps between the profiles necessary to tackle seismic vulnerability and the actual preparation of workers, practitioners, civil servants and volunteers; this aspect will be discussed more in detail in the following chapters.

What is also interesting to underline, is the already mentioned fact that, even if the training schemes collected by partners are in some ways related to the strategic profiles and topics linked with seismic retrofitting, only few of the courses have clearly the purpose to train participants on seismic risks, hazard prevention, procedures to reinforce buildings etc.

In the figure below is shown the total number of courses dealing with seismic contents: only 78 courses specifically transmit seismic contents and this is an impressive result, considering that the total of courses identified and listed at the end of the deliverable is 234.

Another aspect that is important to stress is the fact that in all the contexts analyzed during this research, most of the training programmes identified are organized by private companies or training centers. The courses financed by public bodies or institutions, are a small percentage on the total of available courses.

This is an aspect that the consortium should work on, considering the importance, also for public administration, of training not only their employees but also the workers and professionals who could potentially work on the construction of new buildings or on its restoration. A public regulation in this sense should be identified and adopted by the national or regional governments.

H	Management of safety and health in construction sites for seismic adjustment and restoration
I	Technical temporary interventions to protect and stabilize buildings in emergency and post-earthquake situations
J	Reference seismic legislation, administrative procedures, specific technical standards for existing buildings
K	Project financing and economic management of seismic adjustment and restoration interventions
L	Integrated design: materials and techniques for energy retrofitting and plant adaptation of historic buildings
M	IT tools for integrated design; use of BIM in the management of the seismic retrofitting process
N	Final evaluation process and static testing of seismic adjustment interventions

The stakeholders and participants involved in the local workshops have confirmed the list of units of knowledge.

Learning units for Workers:

A	Comprehension of seismic adaptation design documents, extraction of numerical and technical parameters
B	Characteristics of the materials used in the consolidation and seismic adaptation of historic buildings
C	Technology of buildings and main historical and modern local building systems
D	Collapse mechanisms of historical structures and operational consolidation methods
E	Different techniques for anti-seismic structural consolidation
F	Procedures of conservative restoration and restoration of architectural materials and surfaces

G	Safety measures in structural intervention sites and seismic adaptation of historic buildings
H	Temporary reinforcement methods and techniques for structures damaged by the earthquake or statically unstable

During the local workshops, participants have discussed the list of learning units proposed and have underlined the wide range and heterogeneity of skills; as a consequence, they suggested to design the training as composed by modular elements, considering the different backgrounds and starting levels.
Another aspect highlighted by all the participants is the fact that, most of the skills of construction workers are acquired thanks to on-the-job experiences; the training courses still have a marginal role. The question raised during the discussion is, therefore, how to validate the experience on site and recognize it in terms of acquired skills.

Learning units for Civil servants (non-technicians):

A	Technology of traditional and modern building materials
B	Geotechnics, construction systems and anti-seismic constructions
C	Traditional local construction typologies and anti-seismic distinctive elements to be preserved and enhanced
D	Methods of investigation, diagnosis and infographic representation of historic buildings
E	Techniques for seismic adaptation of historic buildings
F	Seismic legislation, administrative procedures, technical standards for construction
G	IT tools for integrated design; use of BIM in seismic adjustment interventions
H	Enhancement strategies of the cultural and architectural heritage of the territory
I	Project financing, tax breaks and deductions for the seismic retrofitting of historic centers
J	Organizational models and procedures of the civil protection authority
K	Workers safety and health regulation in adaptation or post-earthquake consolidation sites

L	Techniques for restoration and conservation of historic buildings

For the learning units of civil servants (with a non-technical background), the participants of the events suggested to include general competences on the entire retrofitting process and the reference context, in order to help them to make correct decisions and carry out aware bureaucratic procedures. The importance of choosing a not excessively technical language was also underlined, when referring to public employees.

Learning units for Volunteers:

A	Organizational models of the civil protection authority
B	Protection of the health and safety of operators of the civil protection service
C	The static and dynamic behavior of traditional architectural structures; mechanisms of structural damage and collapse
D	First aid operational techniques for people in emergency situations
E	Intervention techniques in post-seismic emergency situations
F	Assessment of damage and usability of buildings after the earthquake
G	Interpersonal communication techniques and stress management

As already said, the four lists of units have been shared among the partners of the consortium and, after their revision and validation, presented during the first local events organized in the 6 countries involved; part of the discussion was devoted to the analysis of these learning units and its consequent validation by experts, representatives of the 4 target groups and trainers.

Here below are presented the results of the matrix analysis presented in paragraph 1.2 (methodology), for each partner country.

4.1 Albania

For Albania, the situation for the group of practitioners is overall negative: the areas of competence with the "best score" are represented in only 3 courses and most of these have an extremely reduced length. The competence units covered only by 1 course are 5 (the 36% of the total), and this aspect should be kept into consideration.

Figure 4-1 Number of areas of competence covered by training for practitioners (Albania)

For what concerns the workers, the situation is not optimal either: as shown in figure 4-1, all the units of competence are covered only by 3 training categories which are periodic updating courses, internships/apprenticeship and seminars.

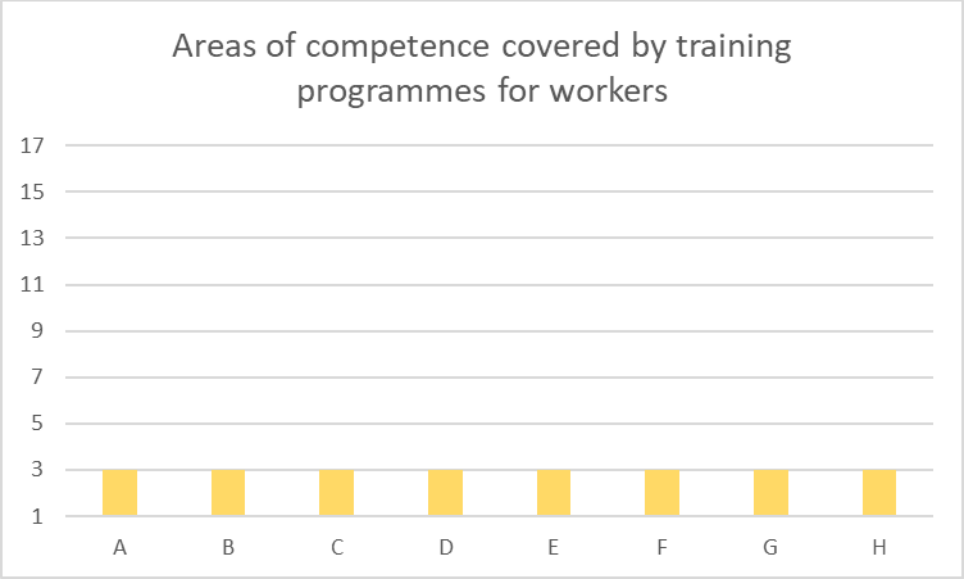

Figure 4-2 Number of areas of competence covered by training for workers (Albania)

The analysis of competence areas for civil servants has highlighted a similar situation: 4 units are covered by 3 specific training categories but, what is clearly evident by observing the figure 4-2 is that 2 learning units are not considered at all. The first one is H “Enhancement strategies of the cultural and architectural heritage of the territory” and the other one is J “Organizational models and procedures of the civil protection authority”.

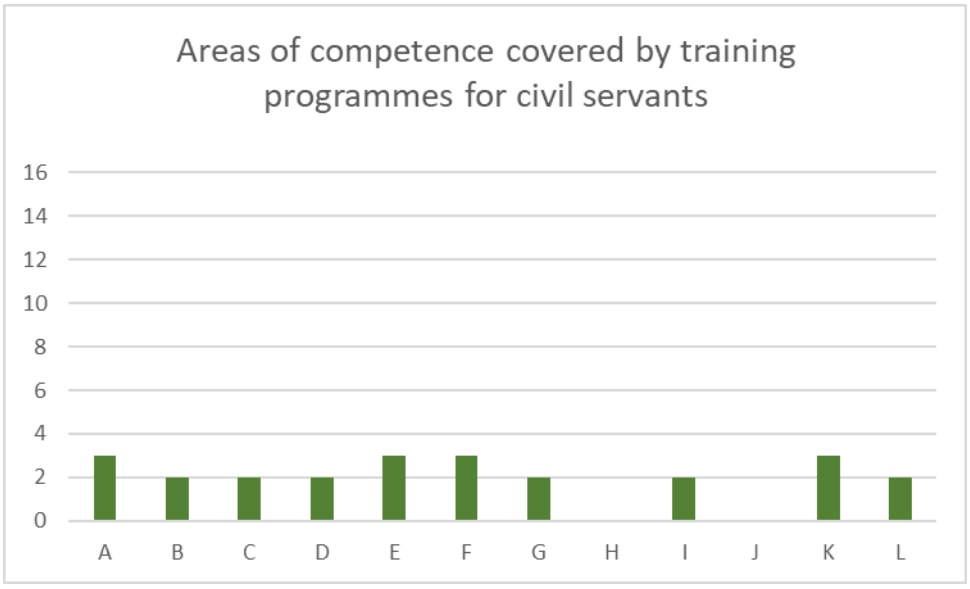

Figure 4-3 Number of areas of competence covered by training for civil servants (Albania)

Finally, the training situation of target group volunteers: the most considered areas of competence are D "First aid operational techniques for people in emergency situations", E "Intervention techniques in post-seismic emergency situations" and F "Assessment of damage and usability of buildings after the earthquake". The evident explanation for this situation is that the competences and skills more practical and relevant after a seismic event (ant its consequent damages) are the first to be taught to volunteers.

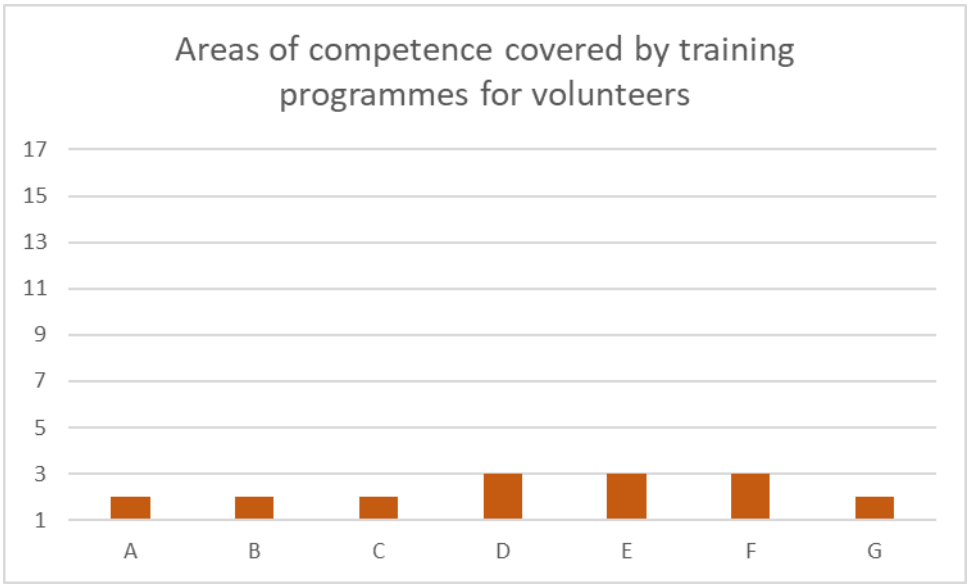

Figure 4-4 Number of areas of competence covered by training for volunteers (Albania)

4.2 Croatia

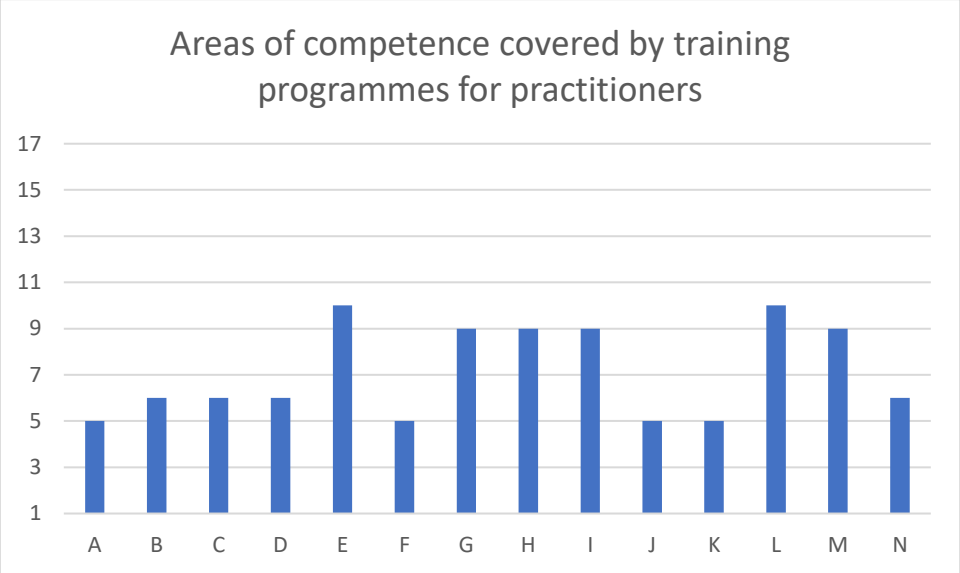

Figure 4-5 Number of areas of competence covered by training for practitioners (Croatia)

Above is depicted the situation of competences transmitted to practitioners, through the training programmes selected. The most represented learning units are E "Advanced systems and tools for architectural and structural survey and graphic elaboration" and L "Integrated design: materials and techniques for energy retrofitting and plant adaptation of historic buildings". These competences are transmitted mostly through workshops dedicated to the specific topic and seminars or conferences. The "worst scores" has been registered by 4 units:

- A "Technology of materials for structural consolidation and restoration",
- F "Instrumental investigation methods on building materials and components and structural diagnosis of historic buildings",
- J "Reference seismic legislation, administrative procedures, specific technical standards for existing buildings Project financing and economic management of seismic adjustment and restoration interventions",
- K "Project financing and economic management of seismic adjustment and restoration interventions".

Concerning the group of workers, the training offer is scarce, as in other countries. In fact, as depicted in figure 4-6, the highest score (which is 4 out of 17) is recorded for competence E "Different techniques for anti-seismic structural consolidation" and G "Safety measures in structural intervention sites and seismic adaptation of historic buildings". Moreover, the competence D "Collapse mechanisms of historical structures and operational consolidation methods" and F "Procedures of conservative restoration and restoration of architectural materials and surfaces" are not at all comprised in the training programmes.

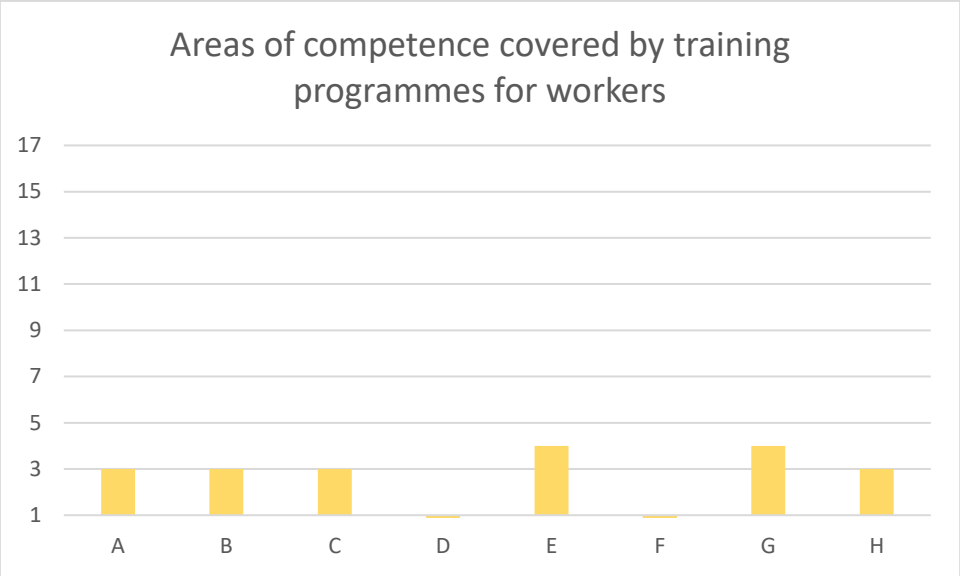

Figure 4-6 Number of areas of competence covered by training for workers (Croatia)

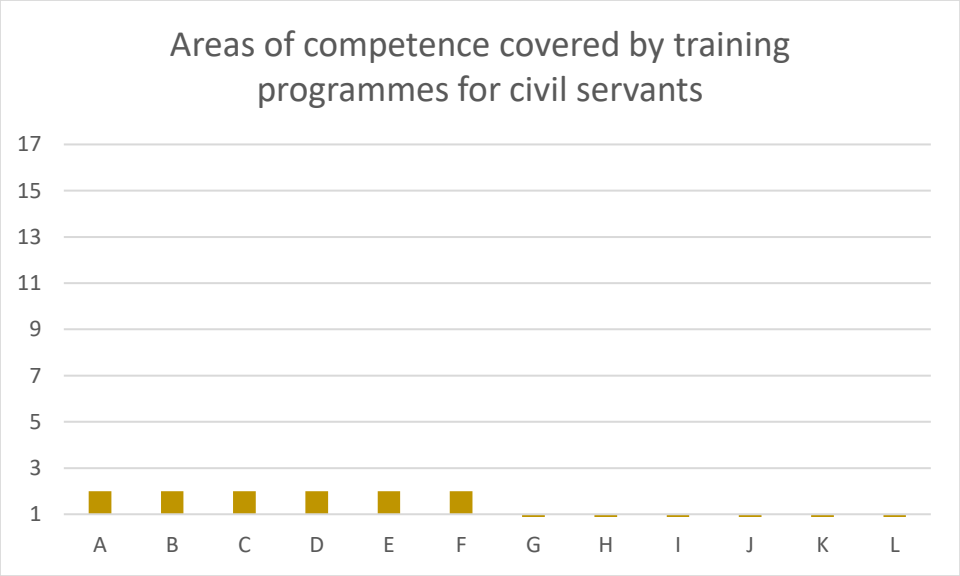

Figure 4-7 Number of areas of competence covered by training for civil servants (Croatia)

The competence units covered by programmes for civil servants and volunteers are even less than for the previous categories: for civil servants (as shown in table XX) only 5 units out of 12 are enclosed in the training considered. Moreover, these competences (from A to F) are only comprised in workshops and seminars, with a maximum length of 1 day. No exhaustive training on seismic assessment and retrofitting is foreseen for this target group. The same situation has been reported for volunteers: they gain basic information on 4 of the 7 competence units through short seminars or conferences.

4.3 Greece

The Partners from Greece have collected and reported the situation highlighted in figure 4-8 for Practitioners. As depicted by the figure, the overall offer for this target group is low: the highest training offer is attributed to the learning unit A “Technology of materials for structural consolidation and restoration”, and also unit B “Technique and technology of seismic consolidation and adaptation interventions on historical buildings

"which is transmitted mainly through University degrees and Master, workshops and seminars dedicated to the specific topic of seismic retrofitting. G "Elements of urban planning, enhancement and management of historic urban agglomerations" and K "Project financing and economic management of seismic adjustment and restoration interventions", are the less considered in training programmes, foreseen only in University programmes and short workshops.

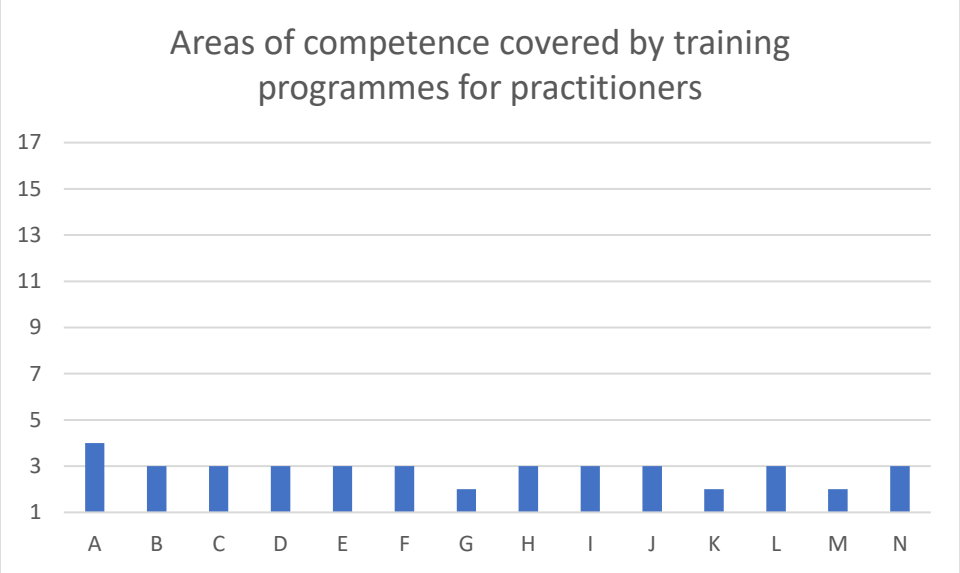

Figure 4-8 Number of areas of competence covered by training for practitioners (Greece)

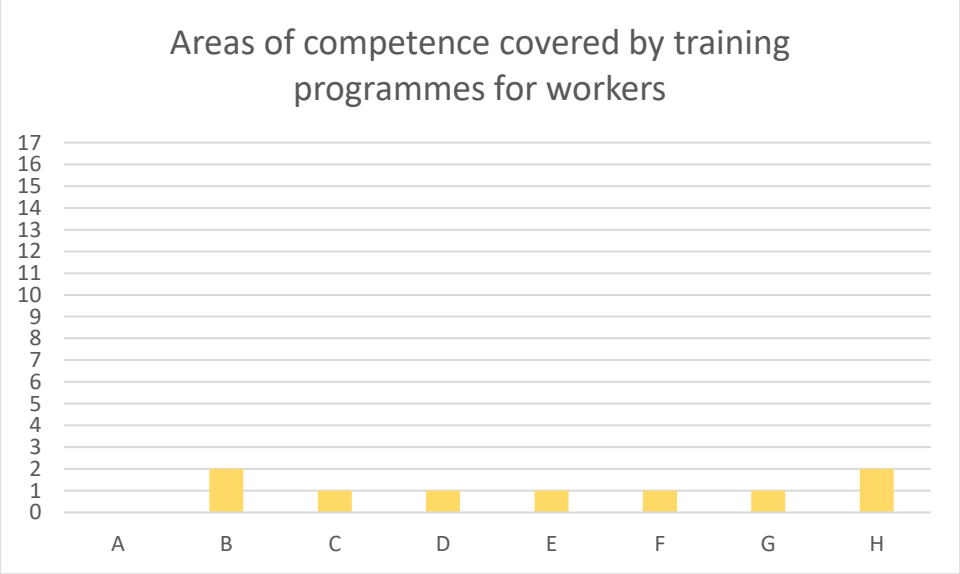

Figure 4-9 Number of areas of competence covered by training for workers (Greece)

Figure 4-9, instead, depicts the situation for workers: the results highlight substantial gaps in the training offer for this target group. The "best score" is recorded for B "Characteristics of the materials used in the consolidation and seismic adaptation of historic buildings" and H "Temporary reinforcement methods and techniques for structures damaged by the earthquake or statically unstable" which are taught through specific workshops and seminars of maximum 1-day length. All the others competence units are covered by the 1-day workshops category.

With reference to the target group of non-technician civil servants, the training offer for the 12 competence units is equivalent and insufficient: only the category of specific workshop of maximum 1-day length provides training contents for these profiles.

As for other countries involved in the analysis, the training courses for volunteers of civil protection is completely absent.

4.4 Italy

Concerning the level and width of knowledge of Italian practitioners, here below are graphically shown the results: the overall training on seismic contents for these profiles is low, as the areas of competence most represented (B, C and J) are covered only by 6 of the 14 categories. Surprisingly, the area dealing with "IT tools for integrated design; use of BIM in the management of the seismic retrofitting process" seems to be completely absent in the Italian training programmes.

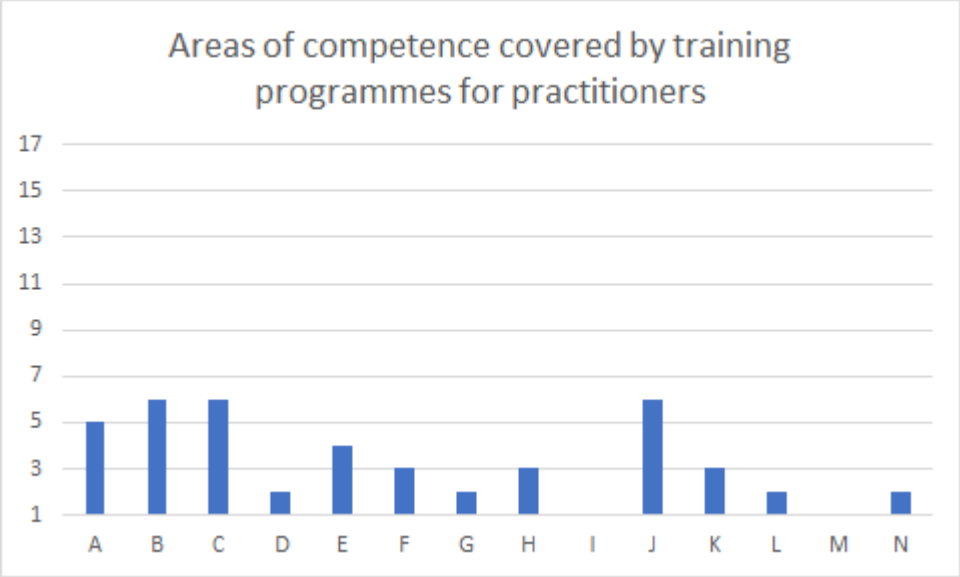

Figure 4-10 Number of areas of competence covered by training for practitioners (Italy)

The training offered in the field of seismic assessment and retrofitting is scarce also for workers. In fact, as shown in figure 4-10, the best result is recorded by G "Safety measures in structural intervention sites and seismic adaptation of historic buildings", a field of competence provided by 3 out of 17 training categories (workshop, periodic update courses with a length of 1 day maximum, and specific FAD or e-learning training). Only 3 other areas of knowledge are present in just 2 of the training categories: B "Characteristics of the materials used in the consolidation and seismic adaptation of historic buildings", E "Different techniques for anti-seismic structural consolidation" and F "Procedures of conservative restoration and restoration of architectural materials and surfaces".

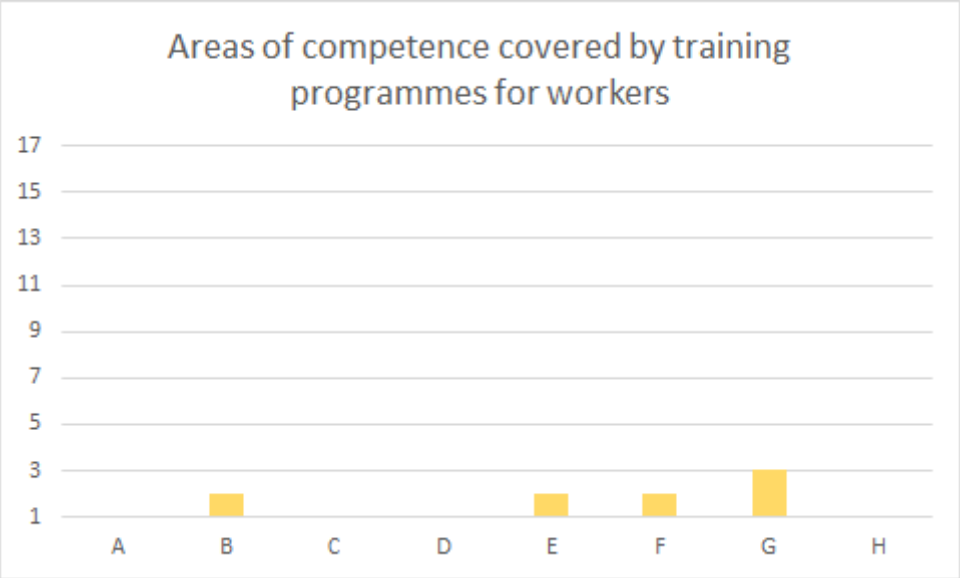

Figure 4-11 Number of areas of competence covered by training for workers (Italy)

For what concerns the group of non-technical civil servants, the available training courses dealing with seismic assessment and retrofitting are only 7 covering the following areas of competence:

- A “Technology of traditional and modern building materials”,
- B “Geotechnics, construction systems and anti-seismic constructions”,
- C “Traditional local construction typologies and anti-seismic distinctive elements to be preserved and enhanced”,
- D “Methods of investigation, diagnosis and infographic representation of historic buildings”,
- K “Workers safety and health regulation in adaptation or post-earthquake consolidation sites”,
- L “Techniques for restoration and conservation of historic buildings”.

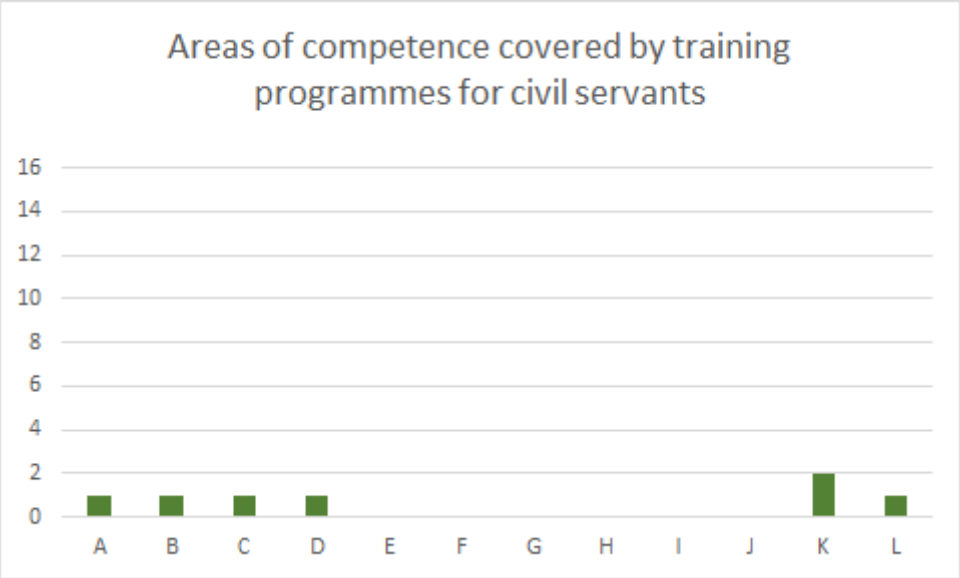

Figure 4-12 Number of areas of competence covered by training for civil servants (Italy)

Concerning the last target groups, the documented training offer for volunteers is not abundant: IIPLE has identified some training programmes organized by regions or the body of civil protection, but the data was not significant enough to produce a comparative analysis. In fact, usually, these courses are organized

internally and specifically for volunteers and members of the civil protection and promotional or informative materials are not available for the public.

4.5 Serbia

A relevant set of information has been collected only for the target group of practitioners: as highlighted by the table below, the learning units most evaluated are B “Technique and technology of seismic consolidation and adaptation interventions on historical buildings” and J “Reference seismic legislation, administrative procedures, specific technical standards for existing buildings”, covered by 6 training categories. Most of the courses are connected with the academic sphere (university and high schools) and seminars or conferences lasting one day maximum.

Instead, several areas of competence are not sufficiently covered: for example, competence D “Historical-artistic research of architectural complexes and documentary investigation of materials and techniques” which is extremely specific, or the areas H and M, dealing with safety and IT tools and which should be regularly taught.

Figure 4-13 Number of areas of competence covered by training for practitioners (Serbia)

Few courses for workers, mainly organized by big companies, cover the competences in seismic contents.

Most of the programmes mentioned can be linked to the categories of on-day workshops or seminars, organized by companies as, for instance, Mapei or Sika.

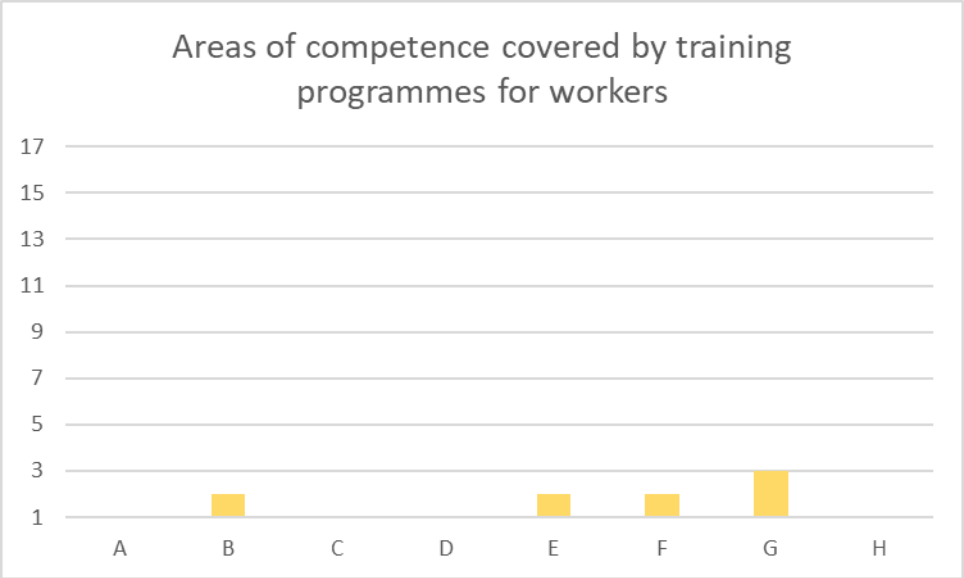

Figure 4-14 Number of areas of competence covered by training for workers (Serbia)

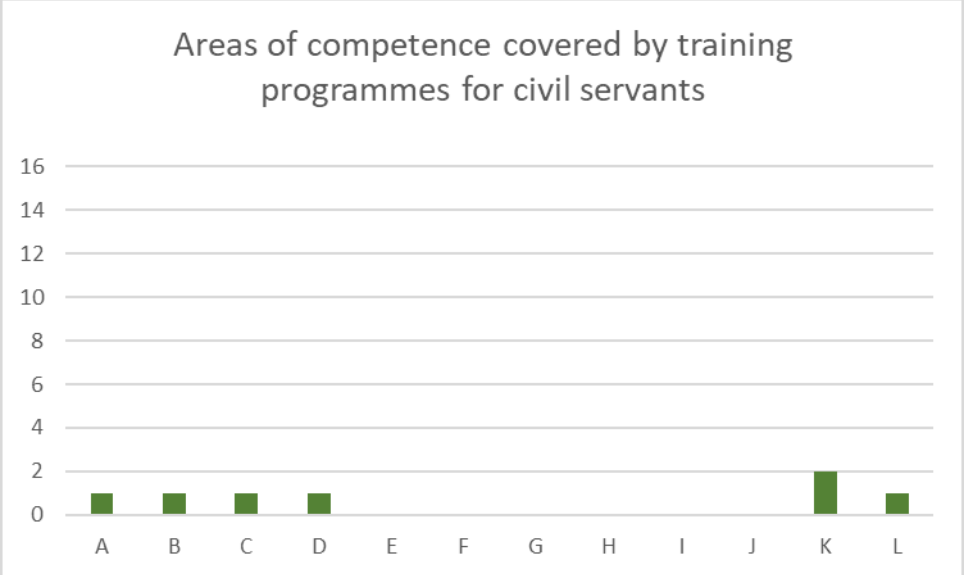

Figure 4-15 Number of areas of competence covered by training for civil servants (Serbia)

In figure 4-15, instead, is depicted the current situation on training for non-technician civil servants.
The explanation for the lack of training programmes (dealing with seismic assessment and retrofitting) for the category of civil servants, is the fact that, so far, in Serbia there is no obligation for these profiles to take part in specific training and updating courses/events in order to manage seismic retrofitting activities.

4.6 Slovenia

For the practitioners, as highlighted in figure 4-16, the trend for the 14 areas of competence is similar; the most represented one is I "Technical temporary interventions to protect and stabilize buildings in emergency and post-earthquake situations[3]", which is included in preparation courses in the field of rescue and protection of maximum 30 hours length. The field of expertise less present in the training programmes identified by the Slovenian partner, but with a relevant connection with the topic is L "Integrated design: materials and techniques for energy retrofitting and plant adaptation of historic buildings".

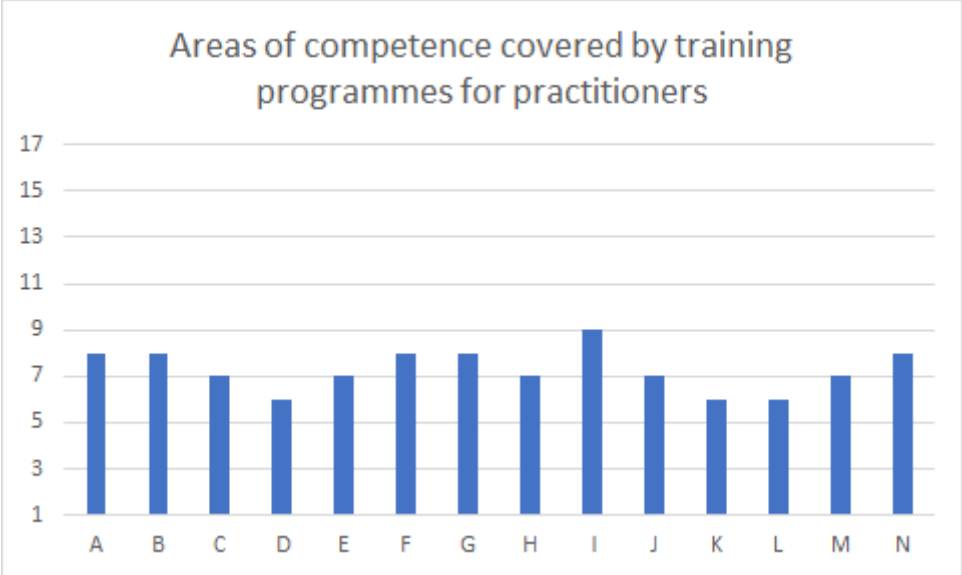

Figure 4-16 Number of areas of competence covered by training for practitioners (Slovenia)

The situation concerning the areas of competence for the group of workers is depicted in figure 4-17:

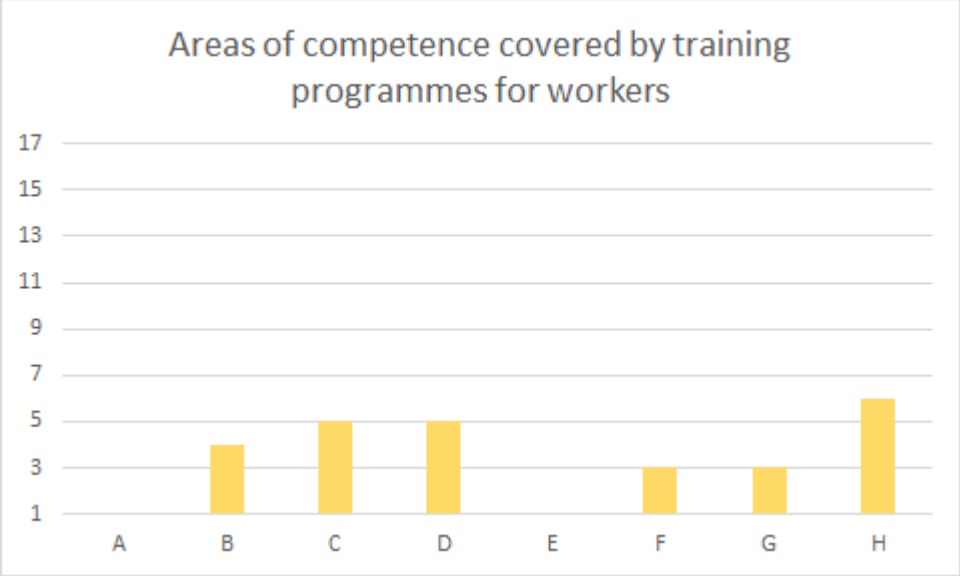

Figure 4-17 Number of areas of competence covered by training for workers (Slovenia)

[3] This learning outcome is addressed by training courses organized by Education center for protection and rescue. It can be attended by different people in this field.

In this case, the gaps for the field of expertise A "Comprehension of seismic adaptation design documents, extraction of numerical and technical parameters" and E "Different techniques for anti-seismic structural consolidation" are extremely evident. The knowledge and skills of Workers in these 2 areas should be improved, as the topic is directly linked with the procedures of seismic retrofitting.
Instead, the area of competence H "Temporary reinforcement methods and techniques for structures damaged by the earthquake or statically unstable" is the most represented in the training courses addressed to this target group: specific training of different lengths, practical training, seminars, workshops.

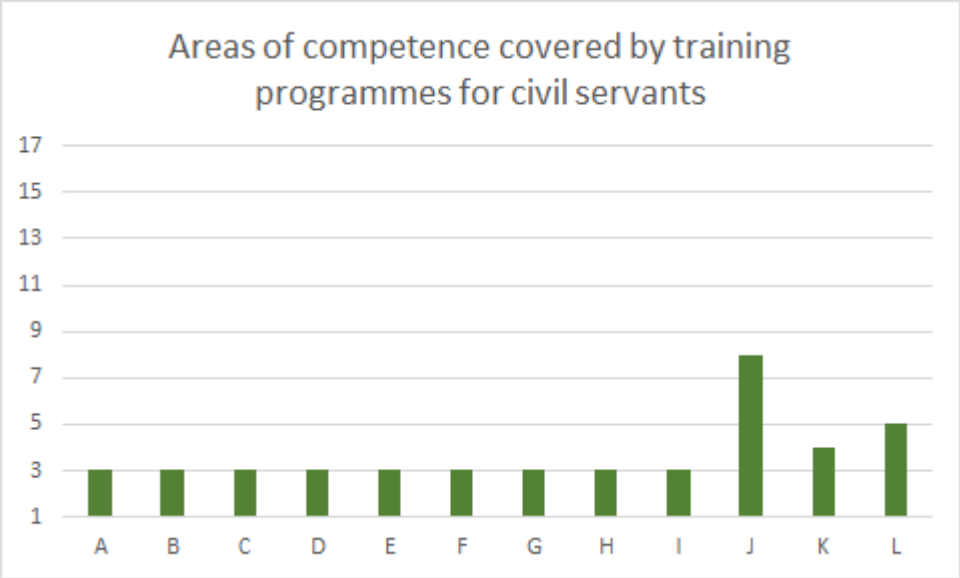

Figure 4-18 Number of areas of competence covered by training for civil servants (Slovenia)

The figure 4-18 provides a quick overview of the situation for non-technical civil servants in Slovenian public institutions: it appears that the majority of areas of competence, attributed to this target group, are not enough covered, whereas only J "Organizational models and procedures of the civil protection authority" is included, as learning units, in 9 categories of training: the majority of the courses available refer to the categories of specific medium-term training and theoretical and practical training of anti-seismic products and techniques.

The last table for this country deals with the target group of volunteers; in this case, the offer is lesser than for the other profiles. The area of competence covered by the highest number of training categories, "First aid operational techniques for people in emergency situations", is present only in 5 out of 17. The majority of these are preparation courses for civil service volunteers and periodic update courses.
The less represented area of expertise is C "The static and dynamic behavior of traditional architectural structures; mechanisms of structural damage and collapse", transmitted only through internship or apprenticeship.

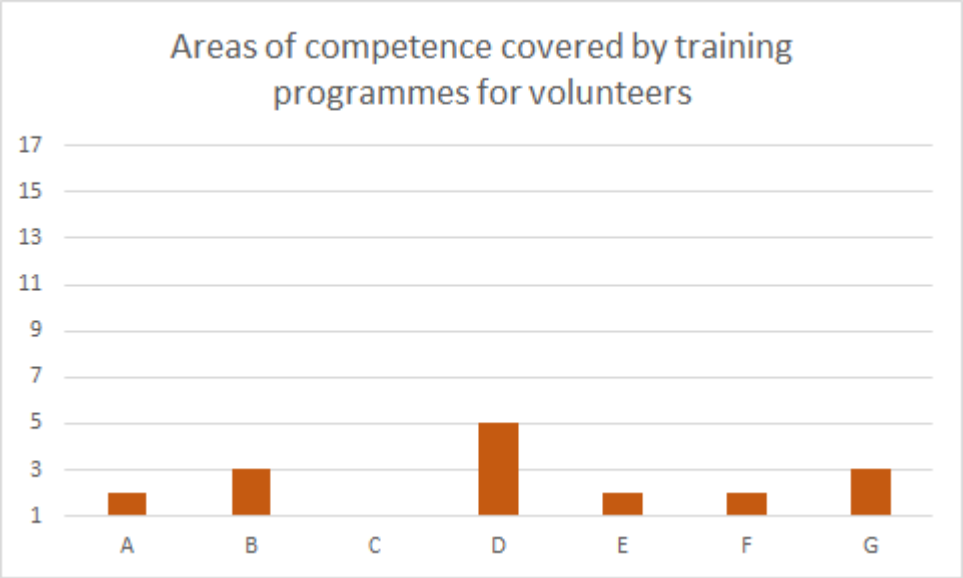

Figure 4-19 Number of areas of competence covered by training for volunteers (Slovenia)

4. 7 Overall analysis for each target group

Below is presented a comparative analysis of the situation in the 6 countries, for each of the target groups considered. The use of table allows to immediately detect the differences, the gaps and the similar offer of trainings.

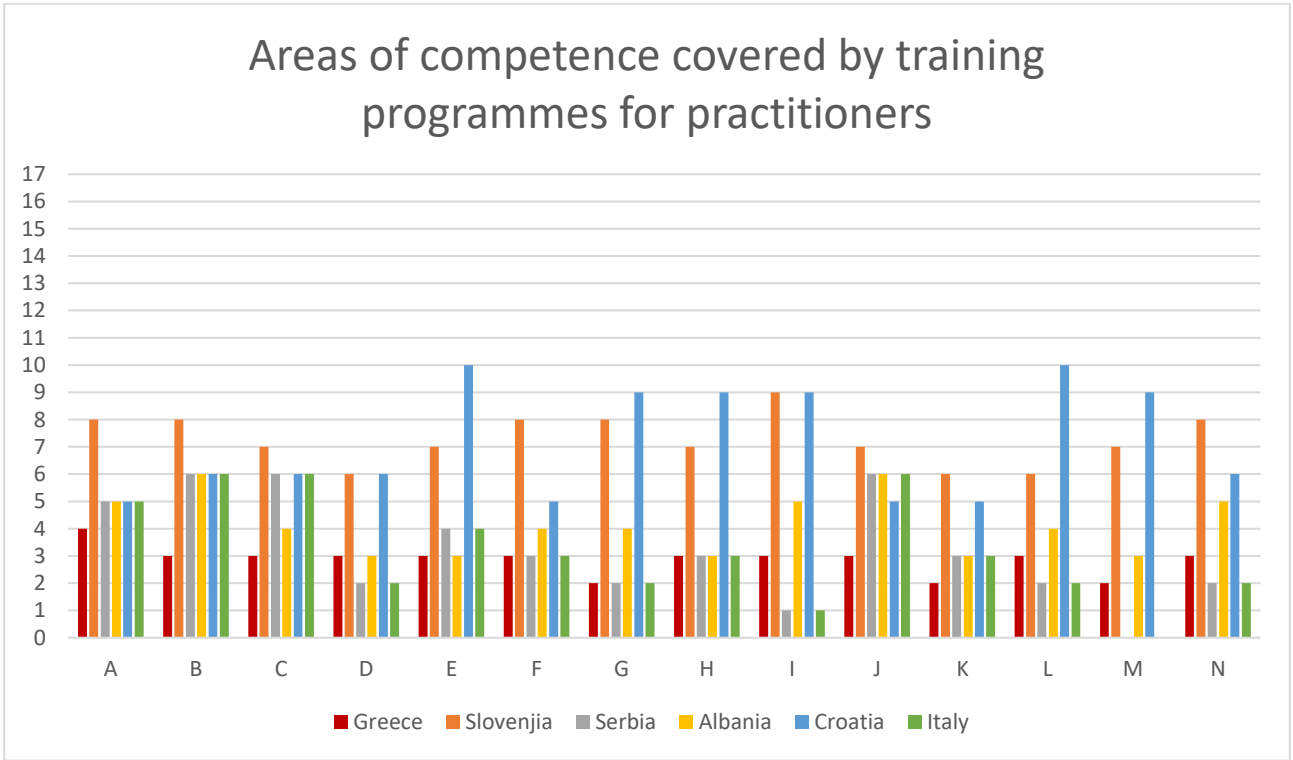

Figure 4-20 Comparative analysis training for practitioners

For the group of practitioners, the training offer is similar for the 6 countries considered for learning unit B "Technique and technology of seismic consolidation and adaptation interventions on historical buildings" and J "Reference seismic legislation, administrative procedures, specific technical standards for existing buildings Project financing and economic management of seismic adjustment and restoration interventions".

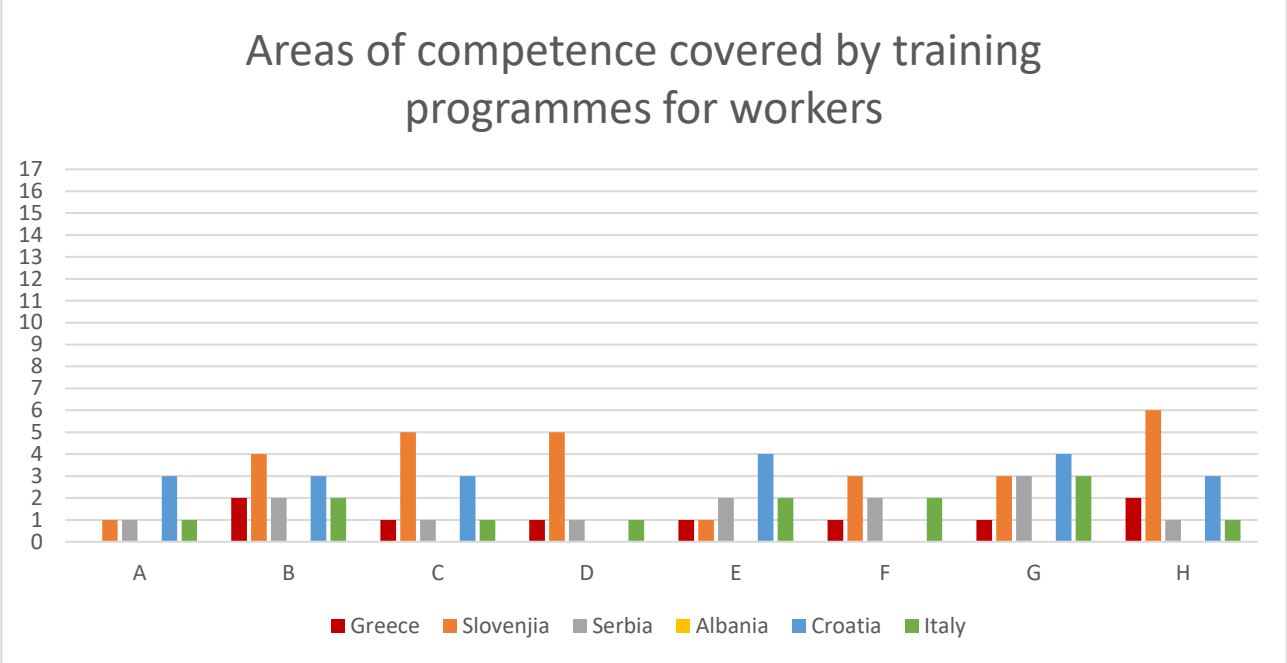

Figure 4-21 Comparative analysis training for workers

The figure XX, highlight the scarcity of training offer for the group of construction workers, in all the countries involved in the analysis. The best score is recorded for the competence unit B "Characteristics of the materials used in the consolidation and seismic adaptation of historic buildings", which is available in all the partners' countries (with the exception of Albania), even if in an extremely low number of categories of training.

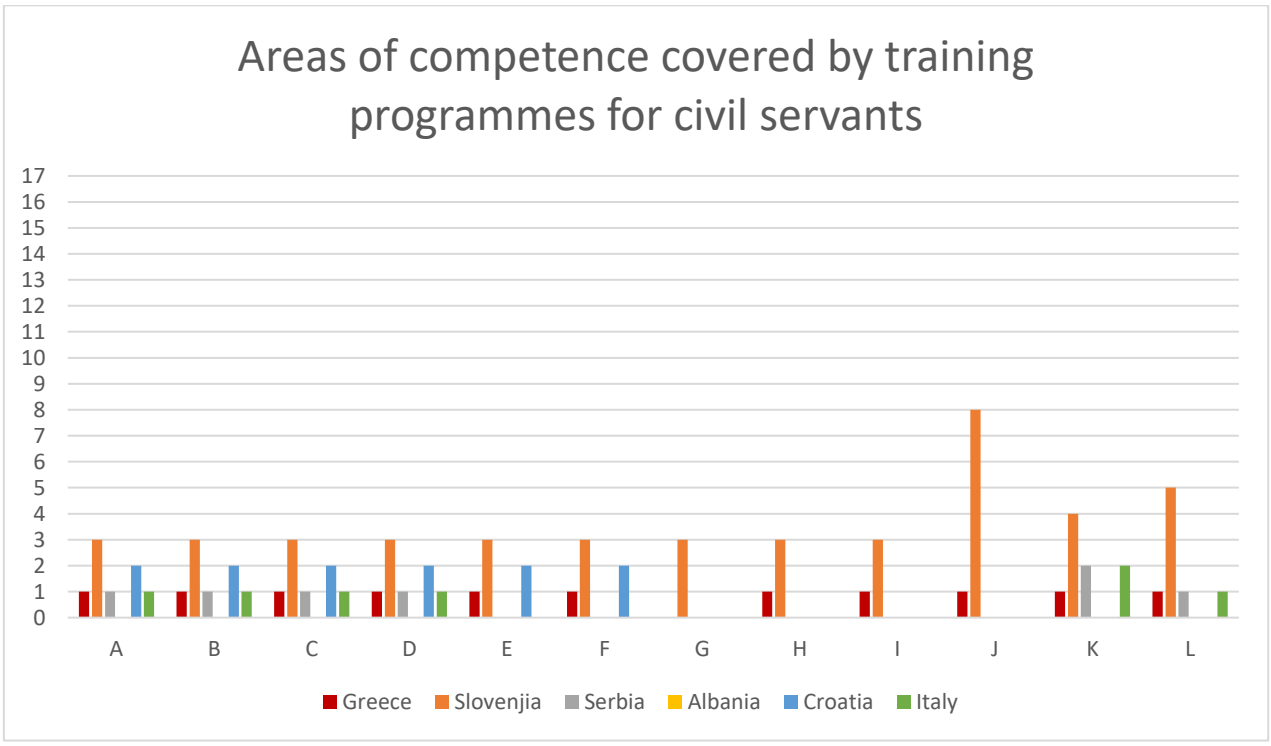

Figure 4-22 Comparative analysis training for civil servants

As for the target group of workers, also for non-technician civil servants the training programmes in the field of seismic vulnerability are extremely scarce. In fact, figure XX clearly shows that none of the areas of competence are considered in all the 6 countries and that only 4 out of 12 units listed are covered by training in at least 5 countries.

Figure 4-23 Comparative analysis training for volunteers

5 Conclusion

In the Adriatic-Ionian area, earthquakes pose a serious danger to man, the environment and nature. Most earthquakes are mild in intensity and cause relatively little damage. However, especially in areas subject to more frequent earthquakes or in correspondence with active tectonic structures, the bodies of buildings can suffer permanent damage and, in the worst-case scenario, even without the knowledge of the occupants or users. The increasing building concentration, the building exploitation of high-risk areas and the so-called illegal constructions, which generally do not fully meet the requirements for anti-seismic construction, contribute to increasing earthquake damage. Added to this, is the frequent lack of public safety infrastructures in the event of earthquakes, both in areas with less building concentration and in urban areas with a high population density.

The territories of the countries involved in ADRISEISMIC host buildings of considerable architectural, historical and cultural value in a widespread manner. At the same time, their territories are strongly subject to the action of earthquakes. The frequency and intensity of these events puts the architectural heritage of these countries in a highly vulnerable condition.

The issue of seismic risk prevention and therefore seismic safety of buildings is now at the center of the interest of society and no longer just of the technical and scientific community. However, there is still a long way to go to spread awareness of the complexity of the seismic phenomenon and the need to manage it through multidisciplinary and coordinated approaches.

Seismic events represent an enormous challenge also and above all for the construction sector. Specifically, the focus is on the process of seismic adaptation and reduction of seismic vulnerability that needs professional profiles with skills in the management, design and adaptation of anti-seismic structures, not only in the construction of new buildings, but also in historic buildings.

The analysis of the state of the art of the current training courses and curricula in the field of seismic vulnerability in the countries involved in Adriseismic Project provided a notable overview of the situation and learning needs. Few lacks have been highlighted by the analysis and it concern, in particular, the restoration of information on the training activities of public bodies and the in-situ informal training that construction companies carry out for their workers and employees.

The results of the research show that currently in none of the partner countries there is a coherent and global approach on the subject of professional training, relating to seismic retrofitting of historic urban centers.
The analysis therefore confirmed the initial intuition at the very start of the Adriseismic project: a lack of forward-looking policies and training actions on seismic prevention that are consistent and capable of stimulating and streamlining the complex seismic safety processes of urban agglomerations.
The current training offer is based on a post-emergency logic in almost all of the cases analyzed: vocational training is planned and delivered in a relevant way in all the countries involved in Adriseismic, especially after the post-earthquake periods.
Furthermore, the specific contents of the current training, mainly concern interventions on buildings already damaged by seismic events, almost completely forgetting the prevention of damage through preventive seismic adaptation interventions or improvement interventions.

In terms of training content, this modality of intervention has repercussions in the widespread absence of transversal skills and professional sensitivity on seismic retrofitting and in the lack of specific skills necessary to operate correctly in seismic prevention interventions.
Another significant point is also the "normative" approach of the current training. The existing training often moves from mandatory regulatory needs on structural calculation procedures and is mainly aimed at structural engineers as a key figure in the design and supervision of the works, significantly excluding the other categories of technicians and public managers of the architectural heritage - urban planning.
There is currently no inclusive training that provides shared and transversal skills for all technicians beyond their specific roles in the process, capable of inducing a real consistency and sharing of objectives, languages and procedures in interventions on existing historic buildings.
With rare exceptions of only partially coherent interventions, there is currently no significant training offer for construction workers who physically carry out the consolidation and reconstruction operations of architectural structures. The burden of worker training falls almost exclusively on construction companies that manage to meet the training needs of their employees with the “peer-to-peer” transmission of operational skills, with informal training and only rarely through training courses organized by those companies that produce and commercialize products, materials and systems for the structural building consolidation.

5.1 Definition of profiles and skills

In this report, we have defined and validated, with the collaboration of the partners, the necessary skills for the three professional profiles we have considered, i.e. technicians, public employees and construction workers.

Knowledge and skills are defined in a relevant way and linked to the activities that are addressed in professional and managerial practice specifically when intervening in the seismic safety process of existing buildings and architectural agglomerations.

It is evident that the professional figures analyzed generally possess sufficient skills and operational abilities that concern the many other professional activities in the construction field, often carried out simultaneously. For example, an architect or engineer already has many professional skills that are acquired during "standard" training and routinely used in the design and construction processes of new buildings or generic reconstructions.

Our analysis, on the other hand, is oriented to the areas and skills that are not provided in classic academic programmes and professional training courses.

The maps of the skills identified in this report will serve in the subsequent phases of the project as a starting point for the definition of the training curricula and also of "tailor-made" in-depth courses, based on the specific needs of those directly involved in seismic retrofitting.

As with any calamity, the destructive moment caused by earthquakes is the apex of a process that involves preventive, emergency and reconstruction activities.

The only really effective way to counteract the effects of the earthquake is prevention, which not only concerns the sphere of construction techniques, but involves a multiplicity of subjects, from companies in the construction chain to manufacturers of building materials and plant engineers, but also citizens, experts in natural phenomena and calamities and, last but not least, policy makers.

Studies and researches on catastrophes constantly increase and are carried out mainly in the moments following the catastrophes themselves; this demonstrate that, the message that the prevention of seismic risk should be a permanent action, is not totally clear and accepted.

Furthermore, the report shows the need to interface with seismic risk in an interdisciplinary way, sharing knowledge and developing a culture of effective seismic prevention that involves technical, economic as well as cultural and political issues.

Annexes

Annex 1 Guidelines for activities of Task 3.1.1

Annex 2 – Template collection of providers

Annex 3 – Template trainings description

Annex 4 – Template for the description of curricula profiles