Shelter

Sustainable Historic Environments hoListic reconstruction through Technological Enhancement & community-based Resilience

D.1.2. Building of best/next practices observatory

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Disclaimer:

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Glossary

Acronym	Full name
ADRC	Asian Disaster Reduction Center
AHEAD	European Archive of Historical Earthquake Data
ASMI	The Italian Archive of Historical Earthquake Data
CA	Consortium Agreement
CCA	Climate Change Adaptation
CH	Cultural Heritage
CHM	Cultural Heritage Management
CVI	Climate Vulnerability Index
DoA	Description of Action
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EC	European Commission
EU	European Union
FLMP	Flood Risk Management Plan
FP	Framework Programme
GIS	Geographic Information System
HA	Historic Area
HFA	Hyogo Framework for Action
ICBS	International Committee of the Blue Shield
ICCROM	International Centre for the Study of the Preservation and Restoration of Cultural Property
ICOMOS	International Council of Monuments and Sites
ISRBC	International Sava River Basin Commission
NERMPCH	National Emergency and Risk Management Plan for Cultural Heritage
OL	Open Lab
PDNA	Post Disaster Needs Assessment
QA	QA - specific hazards and building/site/district scale
QB	QB - specific hazards and urban/territorial scale
QC	QC - non-specific hazards and building/site/district scale
QD	QD - non-specific hazards and urban/territorial scale
RCA	Root-cause analysis
R&I	Research and Innovation
SFDRR	Sendai Framework for Disaster Risk Reduction
SDG	Sustainable Development Goal
UCPM	Union Civil Protection Mechanism
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNDRR	United Nations office for Disaster Risk Reduction
WP	Work Package

1 Executive summary

The overall objective of this report is to provide an effective codification of existing knowledge. This is achieved by adapting existing ontologies, building of a lesson learned and next practices observatory based on existing best practices on adaptive governance for cultural heritage management, local knowledge and historical event.

Specific objectives have been set according to the key elements of the existing knowledge under investigation. These are to identify existing specific ontologies to contribute to reach the same understanding through the co-definition of a core vocabulary, and to inform and facilitate other project activities; to establish a common reference regulatory framework; to build a collection of practices and tools for defining replication conditions; to define a protocol to collect information about historical catastrophes and risks into a temporal dynamic framework to be used by the Open Labs to collect relevant historical information for the case studies.

In order to identify relevant ontologies for SHELTER, the review of the existing literature has been applied as the main methodology. For the other four essential elements (i.e. regulatory framework, good practices, tools, historical events), four data gathering templates have been structured to facilitate the collection of the existing knowledge. In order to reinforce the concept of the next practices, a pilot case on cultural heritage attribute database for Sava River Basin Open Lab has been developed.

The results of this process are, on the one hand, the heterogeneous knowledge collected through the literature review process and the critical analysis of European Union (EU)-funded initiatives; on the other hand, the protocols and data gathering sheets that have been defined to collect and describe the information.

The methodology proposed leads to the definition of the SHELTER ontology itself and the SHELTER core vocabulary, consistent with the ontology but simpler to use when the ontology is not required; the codification of the already implemented EU projects and the related good practices and tools; the experimentation of a mock up for the definition of cultural heritage attributes, to be considered as a promising next practice; the definition of a protocol for the collection of local knowledge on historic events.

However, it is important to acknowledge that the existing knowledge collected in this report cannot provide a complete picture of best practices and next promising practices in the fields of cultural heritage management, climate change adaptation and disaster risk management. The result of this work is rather intended as an observatory that can support Open Labs to implement their project activities.

By performing a cross-cutting analysis among the various types of knowledge collected taking into account the scale, scope and type of hazard addressed, it has emerged that the most of the documents analysed among the good practices, tools, event databases and regulatory frameworks take into account more than one hazard at the time, and the

multi-scale dimension is the most prevalent. Although it is not surprising due to the focus on the international and cross-regional scales (e.g. international regulations, good practices and tools from EU projects), it contributes to provide an indication of the interrelation of different elements that characterise the disaster risk management of the cultural heritage.

The knowledge collected and operationalized in the best/next practices observatory is the results of a combination of multiple approaches. Indeed, the top down methodology (i.e. desk research) has been combined with several interactions with the SHELTER Open Labs. While the interactions will continue throughout the project, this task has been important to define the starting point in terms of knowledge and protocols to further exploit during the next coming OLs activities.

2 Introduction

2.1 Aims and objectives

The overall objective of SHELTER project is to establish cross-scale, multidimensional, data-driven and community based operational knowledge framework for heritage-led and conservation-friendly resilience enhancement and sustainable reconstruction of historic areas to cope with climate change and natural hazards.

Disaster risk management (DRM) and climate change adaptation (CCA) strategies share common approaches and methodologies around concepts such as resilience, vulnerability and capacity [1,2]. Hence, it is necessary to build on national, European and international synergies and similarities already established while integrating Cultural Heritage (CH) into the wider framework of sustainable development. CH should be at the centre of the resilience of Historic Areas (HA), since they are long-term documents of adaptation and of how catastrophes have been overcome in history. Moreover, resilience towards extreme events is increasingly acknowledged as a learning process that must consider cultural, social, economic and environmental dimensions through local knowledge and social memory (experience dealing with change).

The main aim of this report is to provide an effective codification of existing knowledge by adapting existing ontologies, by building a lesson learned and next practices observatory based on existing best practices on adaptive governance for CH management, local knowledge, historical event and linked projects analysis.

Specific objectives have been defined according to the key elements under investigation, which are outlined as follows:

1. Identify existing specific ontologies to contribute to reach the same understanding through the co-definition of a core vocabulary, and to inform and facilitate other project activities;
2. Develop a common reference regulatory framework;
3. Collect practices and tools for supporting OLs to identify the replication conditions;
4. Define a protocol to collect information about historical catastrophes and risks into a temporal dynamic framework to be used by the Open Labs to collect relevant historical information for the case studies.

2.2 Relations to other activities in the project

The SHELTER project has been structured in 9 Work Packages (WP) to ensure fertilisation among the different steps and partners. The main objective of WP1 (Knowledge base: operationalising existing data and knowledge) is to identify and operationalise existing

data, information and knowledge sources defining the data and knowledge structures where all the data collected and generated during the project will be organised and exploited (see Figure 1):

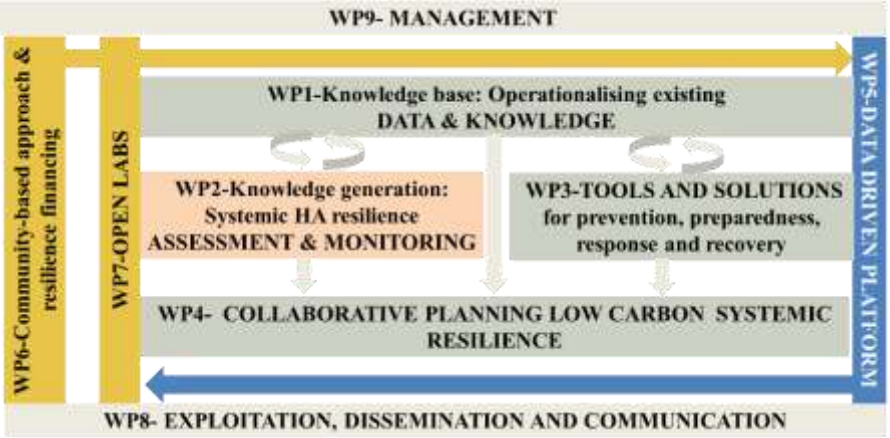

Figure 1: PERT chart of SHELTER

Within WP1, the aim of Task 1.2 (Codification of existing knowledge) is to extract, structure, share, operationalise and take advantage of all the existing knowledge – including local knowledge and social memory. To do so, this task hold together the two main project dimensions: on the one side the EU and international perspective, especially when investigating the international and EU regulative frameworks, the good practices and the existing tools; on the other side, the local dimension of the Open Labs (OLs) has been also taken into account, in particular for the national normative frameworks and the local knowledge of historical events.

This task has a strong relation with all the WPs in SHELTER project, since it establishes the basis for the results of the project. The main relationships are the following:

WP1: Knowledge base: operationalising existing data and knowledge

- Data identified within **Task 1.1** and knowledge collected through the Task 1.2 have been identified, described, filtered and assessed by using complementary approaches. The existing knowledge that results from this deliverable is described through structured data description tables that converge in the Data Mapping Form of Task 1.1 as dataset produced by the related technology partner.
- The outputs produced within Task 1.2 will be integrated in the **Task 1.3** (Data Lake).

WP2: Knowledge generation: Systemic HA resilience assessment and monitoring

- the collection of knowledge benefits from the in-depth desk research performed in **Task 2.1**;
- Task 1.2 also contributes to the identification of monitoring framework in previous projects or other research initiatives, contributing to **Task 2.2** (Systemic resilience

assessment and monitoring framework for HA: structure of indicators, definition of KPIs and resilience co-monitoring strategy);

- **Task 2.3** (Anatomy of Historic Areas: collective characterisation of CH assets) benefits from the protocol to collect information about historical catastrophes and risks (see Section 7);
- Task 1.2 also contributes to **Task 2.4** (Characterisation of hazards, climate change events, impacts and projections/scenarios) by extracting key messages from previous EU projects as input for completing the state of the art on hazards classification- approaches/tools.

WP3: Tools and solutions for prevention, preparedness, response and recovery

- existing knowledge will be the baseline for the definition of technical specifications of the solutions that are going to be developed in WP3, especially in **Task 3.1** and **Task 3.5**

WP4: Collaborative planning for building low carbon systemic resilience

- **Task 4.2** (Definition of protocols, plans and guidelines for CCA/DRM and integration within planning policies) and **Task 4.5** (Policies recommendation on the integration of CH management within existing planning policies, instruments and tools) will start from the codification of existing knowledge in Task 1.2.

WP5: Data Driven Platform

- WP1 outputs represent one of the main inputs for the Data-Driven Platform of WP5. Indeed, datasets, existing knowledge, data lake and multiscale multisource data model are all fundamental pillars to upon which the Data-Driven Platform must be designed, developed and implemented. In particular, data and knowledge identification, respectively in Task 1.1 and Task 1.2, are identified, described, filtered and assessed concerning the requirements, the indicators and the expertise of WP1 involved partners (SIST, TEC, UNIBO, UNESCO, POLITO, ULIEGE, UPV, IHED, UMAS, ISBM, CRCM, RED, EGIS).

WP6: Community-based approach and resilience financing

- D6.1 developed within **Task 6.1** (GLOCAL user requirements) has been used as source of information especially for Section 5 on the regulatory frameworks;
- Task 1.2 also contributes to **Task 6.3** (Adaptive governance schemes mapping) by identifying key elements of the adaptive governance and map them for the SHELTER project;
- D6.5 developed within **Task 6.5** (Methodology for Learning Historic Environments: Local knowledge co-generation, awareness & capacity building) has provided valuable inputs to Section 7 on the protocol for historic events.

WP7: Open Labs

- the relation between Task 1.2 and the **Open Labs** is made of mutual exchanges. In fact, on the one side, Open Labs have contributed and will continue to contribute to cross-check, validate and complement the knowledge gathered in Task 1.2, as for the ontology vocabulary (Section 4), and the regulatory frameworks (Section 5); on the other side, they have been the knowledge providers especially for the historic events collected in Section 7.

WP8: Exploitation, communication and dissemination

- the identification of existing knowledge coming from already funded EU-projects contributes to the activities of liaising with other projects.

2.3 Report structure

The document is structured as follows:

Section 2 establishes the purpose of the deliverable and the links with other work packages and tasks of SHELTER project.

Section 3 describes the overall approach applied to extract, structure and codify the existing knowledge and operationalise it. This section explains the main criteria to determine the relevance of the existing knowledge for SHELTER, the data gathering sheets that have been used, and the cross-cutting characteristics that has been taken into consideration across the different.

Section 4 establishes the ontology tailored to the requirements of the SHELTER project. The specific methodology applied for this investigation is illustrated, as well as the main results and the two main outputs: the SHELTER ontology itself as a non-formal extension of a suitable top-level / mid-level formal ontology, and a core vocabulary, consistent with the ontology but simpler to use when the ontology is not required.

Section 5 describes the investigation occurred to build a robust common reference regulatory framework for defining replication conditions.

Section 6 present a collection of good practices and tools, as well as a pilot case for the next practices.

Section 7 establishes the protocol to collect information about historical catastrophes and the results from the interaction with the OLs. It presents also the literature review results to build the protocol, and the preliminary findings from the OLs.

In **Section 8** the conclusions are drawn.

In **Section 9** the references are provided organised separately for each section.

Annexes I to VI present the completed data gathering sheets used for fulfilling sections 5 and 6, the reference numbers for sections 5 and 6 with the corresponding progressive codes of the items inserted in the regulatory framework, best practices and tools data gathering sheets, the mock-up for CH attributes template described in section 6, the first results from the interactions with the OLs for section 7.

2.4 Contribution of partners

The following table (Table 1) details the contribution of each partner:

Partner	Contribution
UNIBO	Responsible for the coordination of the task and deliverable. Responsible for definition of the overall approach and methodology. Drafting of Section 1, 2, 3, 6 and 8.
TECNALIA	Responsible for methodology and contents of Section 4. Review of the whole document.
UNESCO	Responsible for contents of Section 5.
SIST	Coordinator of WP1 providing the links with the other Tasks. Contributions to the overall approach. Responsible for methodology and contents of Section 6.7.1.
CRCM	Responsible for contents of Section 6.5.
POLITO	Responsible for methodology and contents of Section 7.
ULIEGE	Review of the whole document.
UPV/EHU	Review of the whole document.

Table 1: Contribution of partners

3 Overall approach

As already mentioned in the introductory section, this report aims at consolidating both the available knowledge from previous EU-projects and from the practical experiences of the different Open Labs for all the project partners and the broad public, to build a meaningful knowledge baseline for the SHELTER project.

Among the various existing knowledge, some key elements have been already identified and included in the DoA of the Grant Agreement as existing knowledge to be investigated:

- **Specific ontologies and controlled vocabularies** dealing with the domains of CCA, DRM and CHM;
- DRM policies, emergency protocols and CCA strategies developing a global database (focused in case study countries) for comparison and build a **common reference regulatory framework** for defining replication conditions;
- Relevant **good practices** (practices already validated and demonstrated) and **next practices** (innovative practices not totally documented but promising and inspiring) coming from the EU and beyond and related with CCA and DRM in CH;
- **Tools** and methods from EU-funded projects and linked R&I initiatives;
- **Historical events descriptions** from local stakeholders to define a knowledge baseline in OLs.

To identify the relevant ontologies for SHELTER, the review of the existing literature has been applied as the main methodology. The main criteria to determine relevance was the linkage to three domains stated above: Climate Change Adaptation (CCA), Disaster Recovery Management (DRM) and Cultural Heritage Management (CHM). The results of this process are the SHELTER ontology itself and the SHELTER core vocabulary.

For the other four key elements (i.e. regulatory framework; good practices; tools; historical events), four data gathering templates have been structured to facilitate the collection of existing knowledge. Additional details on the structure of the four templates are provided in the Methodology section embedded in Section 5, 6 and 7.

Cross-cutting characteristics have been included in all the four templates, as displayed in Figure 2:

- *Progressive code:* a progressive code (e.g. UNESCO_b_001) has been used to identify each knowledge item, and to provide a unique code to embed the name of the partner responsible for the data gathering, the letter assigned to the subtask and consequently to the template, and the progressive number. This codification intended to refer to the items collected easily, and to avoid overlaps between the different key elements of the identified knowledge;

- *Scale:* it represents the spatial scale that the identified item refers to, among the ones in the drop-down menu (see Figure 2); when multiscale is selected, additional information should be provided to specify the relevant scales further;
- *Addressed hazard*: a list of relevant hazards for SHELTER have been added as a drop-down menu (see Figure 2); when the multi-hazard item is selected, additional information should be provided to further specify the relevant hazards;
- *Scope*: it refers to the resilient dimension(s) that the identified item refers to, among the ones in the drop-down menu (see Figure 2); when multiscope is selected, additional information should be provided to further specify the relevant scope;
- *Quadrant*: it is based on the resilience conceptual framework as described in Deliverable 2.1 HA Resilience structure [1]. It is structured in four quadrants depending of the degree of certainty regarding the hazards and the scale. The Y axis represent the hazards and the degree of certainty that we have about them and splits the framework between the generalised (top half) and specified resilience (bottom half). The X axis represent the geographical scales of the HA. Four quadrants (i.e. QA, QB, QC, QD) have been identified (see Figure 3);
- *Relevance to SHELTER*: the relevance is assessed according to qualitative criteria based on the available information. None, low medium and high can be selected from a drop-down menu. None applies when the items have been identified among the ones potentially relevant, but the second check suggests to discard them; low applies when the document/practice/tool/event slightly match only with the general objectives of SHELTER; medium occurs when the document/practice/tool/event refers clearly to one or more assessment quadrants or /and it refers clearly to one or more dimensions of Historic Area resilience (economic, social, physical, institutional and cultural); high applies to a document/practice/tool/event that focuses on cultural heritage in historic areas or / and evidences/ impact from its application are available;
- *Keywords:* free keywords can be added here to tag the contents;
- *References:* it lists main references used;
- *Comments:* additional explanations can be provided here.

The Scale, Hazard, Scope, Relevance to SHELTER, Quadrant cross-cutting characteristics have been adopted in coherence with SHELTER Deliverable 2.1 HA Resilience structure [1].

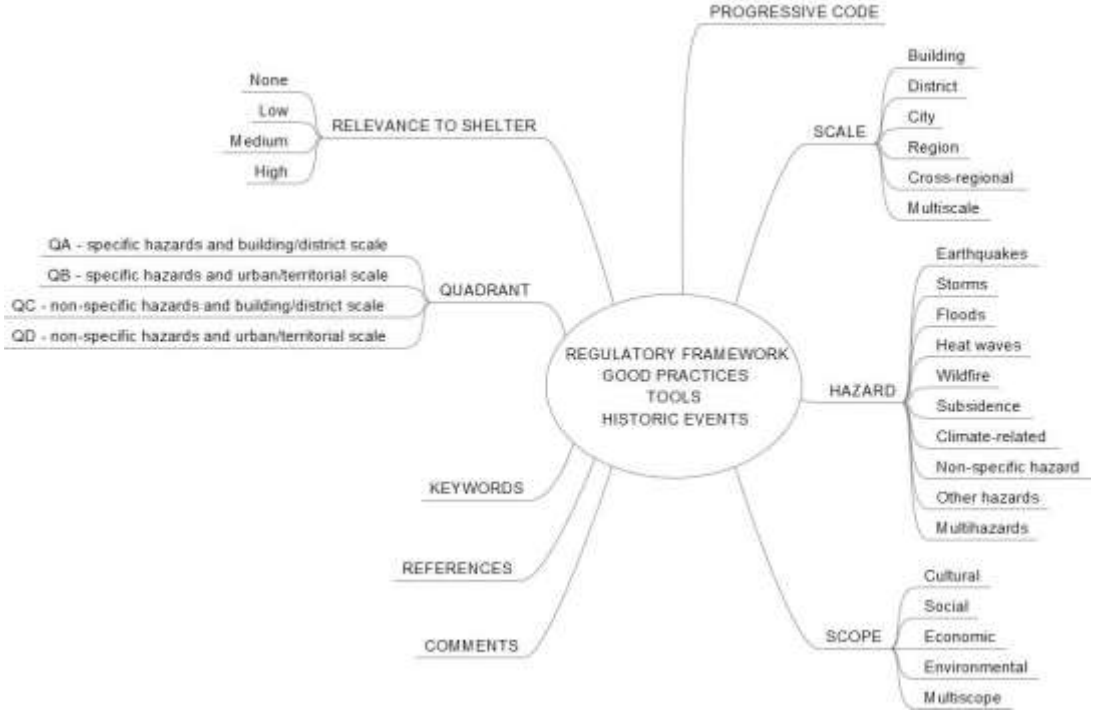

Figure 2: Structure of the cross-cutting characteristics

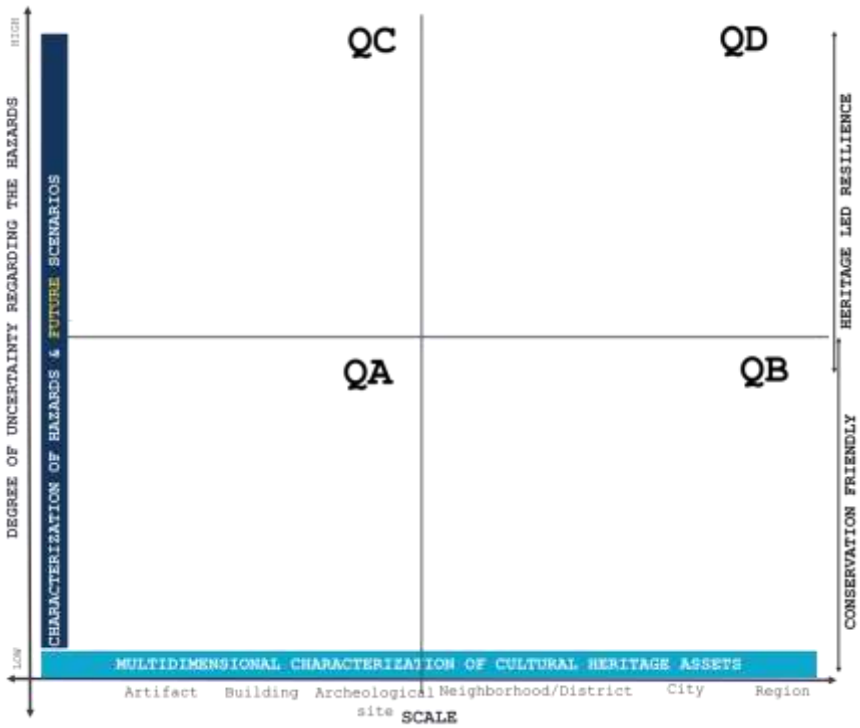

Figure 3: Structure for SHELTER resilience assessment and knowledge structuring

4 Towards a collective knowledge: the ontology

4.1 Setting the scene and rationale

The topic of resilience and sustainable reconstruction of historic areas to cope with climate change and hazard events stands in the intersection of three big fields: climate change adaptation, disaster risk management and cultural heritage management, under the umbrella of sustainable development. This intersectionality, together with the nebulous nature and heterogeneous roots of some of the key concepts addressed in SHELTER (such as resilience, sustainability and community) made it necessary to develop mechanisms to build a common understanding within the consortium and the Open Labs. Although this effort has to be maintained during the whole project, this chapter describes the building of the base ontology and core vocabulary that will evolve with the needs of the project. The ontology will then inform and facilitate other activities in the project, including the definition of the multiscale and multisource urban and regional model and the Resilience ID.

4.2 Methodology

As stated in the Grant Agreement of the project, the work related to the SHELTER ontology includes the identification of existing, related ontologies, and the use of resilience and vulnerability as boundary concepts when needed. This document also points out the aforementioned domains of climate change adaptation (CCA), disaster risk management (DRM) and cultural heritage management (CHM) as sources of knowledge, with the SHELTER ontology being, partially, in the intersection of those domains and thus requiring to harmonise and extend them. It finally proposes that the ontology will inform and facilitate other activities in the project.

The requirements for this work can be summarised in three points:

- Having a consistent vocabulary, e.g. preferred terms with shared definitions, for SHELTER related concepts.
- Facilitating the semantic annotation of data and documents, for instance to facilitate certain information retrieval tasks.
- Guiding in the design of multiscale, multisource, urban and regional data models.

Analysing these points, it was decided that a formal, axiomatised ontology did not necessarily provided the best balance of complexity vs usability for this project, so we shifted our efforts towards a more terminological, or lexical, one. Although the distinction between terminological and formal ontologies is neither well-defined nor strict, we shifted our focus more towards hierarchically arranged concepts with natural language definitions, and less to logical axioms and strict definitions that could support complex inferences.

With all these considerations in mind, a number of basic principles to guide our work in the SHELTER ontology based on the proposal by [1], were chosen. Although these are intended for the development of formal ontologies, many of them are still valid advice in general for ontology development. Not all of them are appropriate for our needs, and some of them are just common sense, e.g. "Identify the domain of your ontology", or avoiding common errors, but we want to highlight a number of them which have helped to provide a method to our work. First of all, the basic principles that have shaped the ontology:

1. Follow a multi-tiered architectural approach: a domain-neutral top-level ontology, a mid-level ontology covering a broad domain and a lower-level ontology which is more specialised.
2. Arrange your terms to form a hierarchy by *is_a* relations. A *is_a* B only if every instance of A is also an instance of B. Every concept must be connected to the root node by a chain of *is_a* relations.
3. Identify and evaluate existing ontologies with overlapping domains.

And then other principles which have been useful to find, refine, and define terms:

4. Create a draft list of domain terms and refine it striving for consensus with the domain experts (in our case, the SHELTER partners).
5. Provide human-readable definitions for every element. Definitions should use terms which are simpler than the term being defined.
6. Use acronyms sparingly, and only if they are part of common discourse. Avoid also abbreviations and ellipses.
7. Avoid negative terms. Avoid also expressions which cancel the meaning of the term they refer to (such as cancelled, absent…).
8. Avoid the word "other" in terms.
9. Avoid disjunctive and conjunctive terms. Nothing in reality is an "X or Y", nor an "X and Y". There are Xs and there are Ys. This does not mean that the words "and" and "or" cannot be used in the terms, although they should be minimised. It means that a term should not encompass two different concepts.
10. Terms should be nouns and noun-phrases that are singular in number. Avoid mass terms ("information"), use equivalent count terms ("information artefact") when possible.

We decided to provide two results from this work. The SHELTER ontology itself (see Section 4.3) as a non-formal extension of a suitable top-level / mid-level formal ontology, and a core vocabulary, consistent with the ontology but simpler to use when the ontology is not required (see section 4.3.1).

A bibliographical review was conducted in order to identify relevant ontologies for SHELTER. The main criteria to determine relevance was the linkage to three domains

stated above: Climate Change Adaptation (CCA), Disaster Recovery Management (DRM) and Cultural Heritage Management (CHM).

The CIDOC Conceptual Reference Model (CRM) [2] is a formal ontology that defines concepts and relationships related to cultural heritage documentation. It is intended to be used as a semantic interoperability tool among different sources of cultural heritage information. Besides its status as a standard in its field, and its indirect relation with at least one of the domains of SHELTER, there is a core subset [3], that can be used as an upper level, or top-level, ontology.

The HERACLES Ontology [4], developed for the EU funded HERACLES project [5] includes concepts related to the preservation of cultural heritage, specially built, tangible, in the context of climate change. It thus covers aspects from at least two of the three domains of the SHELTER ontology.

The I-REACT Ontology developed during the EU funded I-REACT project [6] models concepts mainly related to risk management related to the climate change.

So, CIDOC CRM addresses Cultural Heritage, although with a strong focus on museum collections, HERACLES addresses some aspects of Cultural Heritage in the context of Climate Change and I-REACT considers concepts of Risk Management related to the Climate Change.

4.2.1 Gaps detected

As written before, the SHELTER ontology is partially in the intersection of different domains: climate change adaptation (CCA), disaster risk management (DRM) and cultural heritage management (CHM). Being this an initial guideline, the SHELTER partners have selected a number of especially relevant topics to define the main concepts of its ontology. Other ontologies have proposed concepts from those domains, or other closer ones, so it was necessary to highlight those knowledge areas which have been less considered in other projects but are crucial to SHELTER, so that this project can focus more on them.

Considering the two main domain ontologies used a reference, HERACLES and I-REACT, briefly described in the previous section, the main gap detected is related to the concept of **Resilience**. Nor the concept of resilience itself, neither activities, tools, approaches or capabilities related to that concept are considered in those two ontologies. This concept is central to SHELTER, and the ontology shows it clearly, as six out of eleven root terms in the ontology are related to it (see Table 2).

Among the concepts which are relevant for SHELTER, HERACLES includes several ones related to cultural heritage. HERACLES makes an important effort to model explicitly different classes of Cultural Heritage Properties, where concepts quite specific such as Social Identity or Consultation of Civil Society, both a kind of Cultural Value, are included.

On the other hand, Natural Heritage is not in HERACLES, except indirectly by means of the Nature Monument which in HERACLES is a kind of Cultural Heritage. SHELTER has chosen to keep a higher level of abstraction related to Heritage Properties in its ontology, including a concept of Cultural Values, but not further specialisations of it.

HERACLES also includes a number of classes related to Risks. Risk is an explicit higher-level concept; Vulnerability is a kind of Cultural Heritage Property and Hazard and Exposure are terms used in the definitions of other concepts. SHELTER has chosen to model Risk Component as a root term, instead of Risk, making it possible to define Hazard, Vulnerability and Exposure as separate, but related, concepts in the ontology by making them specialisations of a Risk Component, and Vulnerability Concept as another root term so different subtypes can be defined. The concept of Response is also a higher-level concept in HERACLES with a general definition. SHELTER has chosen to model Response as a Disaster Risk Management Phase, so other concepts related to Risk Management in a broader sense, e.g. starting from the Preparedness and the Prevention, can be modelled together. This approach is similar to the one chosen by I-REACT, where concepts such as Preparedness and Prevention are subtypes of Risk Management Phases.

I-REACT models Hazards as 'HazardEvents', with a number of specific subtypes, such as Flood or Fire, or even 'ForestFire'. As SHELTER has chosen to model Hazard as a Risk Component, without further specializations, this part of the I-REACT ontology could be useful to those interested in modelling a Hazard in more detail. Besides RiskManagementPhases and HazardEvents, I-REACT includes the concept of a RiskMap, a map that shows risks associated to hazards, among its risk-related concepts.

4.3 SHELTER ontology

The CIDOC CRM plays the role of both the top and middle-level tiers of the SHELTER ontology. More specifically, CIDOC CRM Core is the top-level ontology, and the full CIDOC CRM is the middle-level one.

The E55 Type concept is intended to be the interface of the CIDOC CRM to domain specific ontologies and thesauri [2] (p. 26). Instances of E55 Type are types, and they can be associated to instances of CIDOC CRM Entities by means of the P2 Has Type Property. We considered two main options to benefit from this in the SHELTER project:

1. Create a vocabulary and make each of its terms an instance of E55 Type. These terms could then form a hierarchy, if necessary, by expressing that some of them are more general, and others are more specific. The CIDOC CRM tool for this is the P127 has broader term (has narrower term) relation. With this relation we can express that any of the terms in the vocabuarly is broader (more general) than other, which in turn will be narrower (more specific).

2. Create an intermediate set of concepts between the full vocabulary and the E55 Type class in CIDOC CRM, modelled as subclasses of E55 Type. These concepts would group related terms in the vocabulary, providing a simpler view of the thematic domain of SHELTER and contributing to refine the choice of terms in the vocabulary.

Option 1 was chosen, and a hierarchy of the terms with the P127 Has Broader Term relation was designed. The hierarchy allows to group related concepts and it makes it easier to understand the scope and main domains in the SHELTER ontology. Making every term in the vocabulary an instance of E55 Type, i.e. every defined term is a CIDOC CRM type, avoided having two kinds of elements (subclasses of E55 Type and instances of those subclasses) that option 2 would have produced. However, in order to make it more clear that the vocabulary is defined for the SHELTER project, and prevent collisions with the same terms used differently, we introduced a single subclass of E55 Type, SHELTER type, and every SHELTER term is an instance of this subclass, which is there just as a way to provide a common element specific for SHELTER. This is shown in Figure 4.

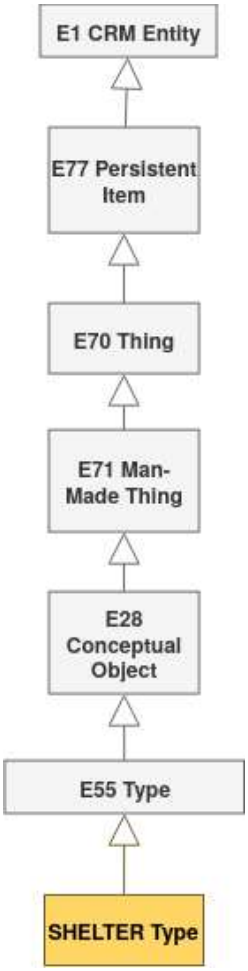

Figure 4: The SHELTER Type is the only class added to the hierarchy of the CIDOC CRM Ontology

The terms of the SHELTER vocabulary are thus instances of SHELTER type and, because of that, they are types in CRM CIDOC. This fact provides a mechanism to link the SHELTER core vocabulary to a formal ontology when needed. Besides this, for the root terms in the terminological hierarchies formed, we point out which CIDOC CRM classes could be associated with them by means of the P2 Has Type property (see Table 2).

SHELTER Root Terms (in the hierarchy of E55 Types formed by the vocabulary)	CIDOC CRM classes that could have this type
Disaster Risk Management (DRM) Phase (Figure 6)	E7 Activity
Heritage Attribute (Figure 6)	E70 Thing
Historic Area (Figure 6)	E27 Site
Resilience (Figure 6)	E70 Thing
Resilience Activity (Figure 7)	E7 Activity
Resilience Approach (Figure 8)	E28 Conceptual Object, E7 Activity
Resilience Capability (Figure 9)	E89 Propositional Object
Resilience Stakeholder (Figure 9)	E39 Actor
Resilience Tool (Figure 10)	E71 Man-Made Thing
Risk Component (Figure 11)	E2 Temporal Entity
Vulnerability Component (Figure 11)	E2 Temporal Entity

Table 2: Root terms in the SHELTER vocabulary and suggested CIDOC CRM classes that could be associated to them via the P2 Has Type property

Figures 6-11 show how the SHELTER ontology terms, instances of SHELTER Type, are hierarchically arranged by means of the P127 Has Broader Term property of CIDOC CRM. Figure 5 shows the two graphical elements used in those figures.

Figure 5: Legend to interpret the diagrams that show the hierarchies of terms

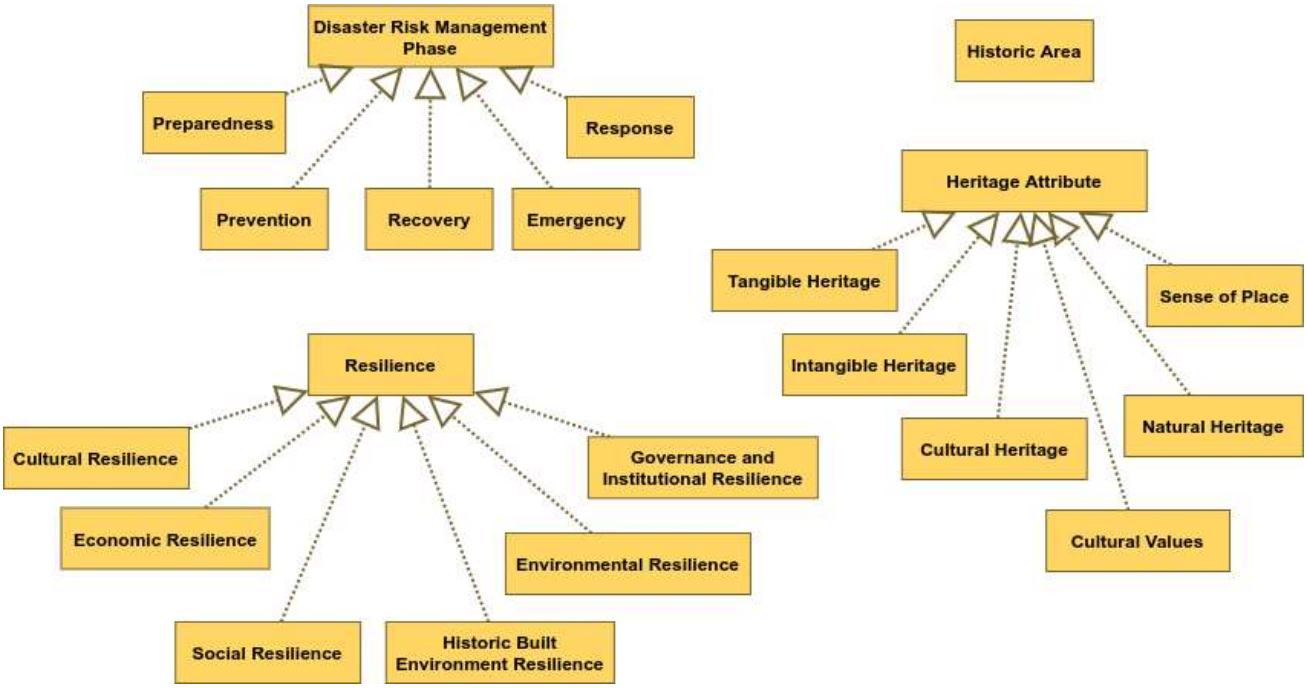

Figure 6: Terminological hierarchy with root terms DRM Phase, Historic Area, Resilience and Heritage Attribute

Figure 7: Terminological hierarchy with root term Resilience Activity

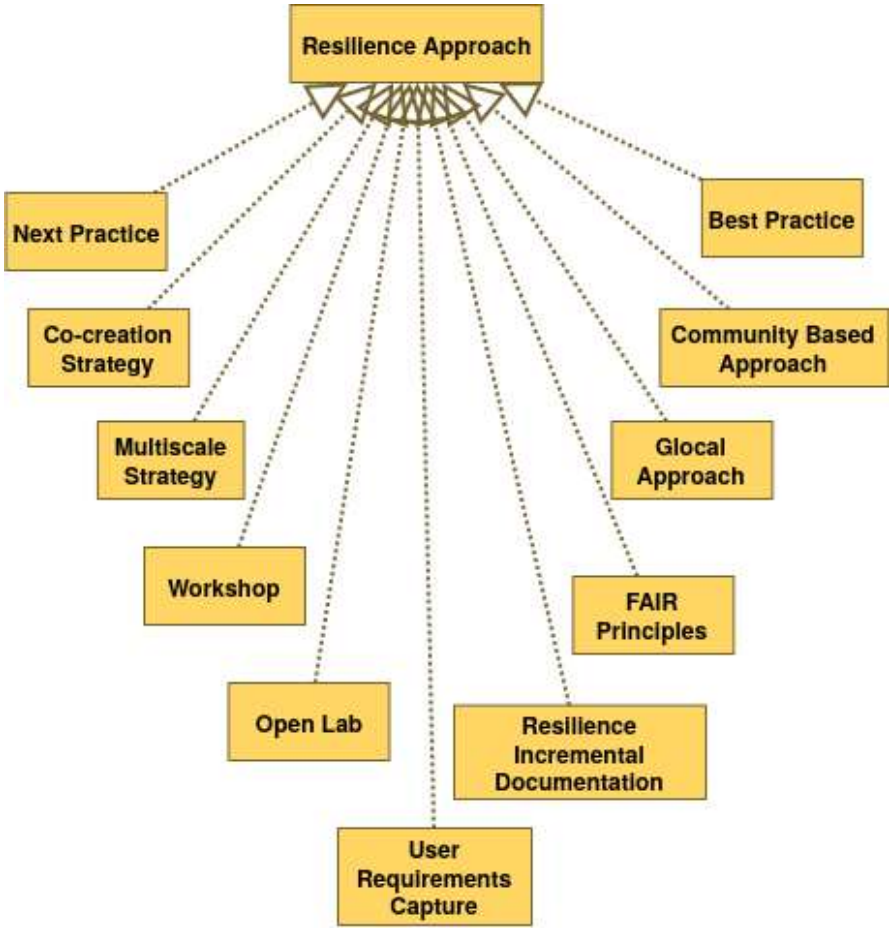

Figure 8: Terminological hierarchy with root term Resilience Approach

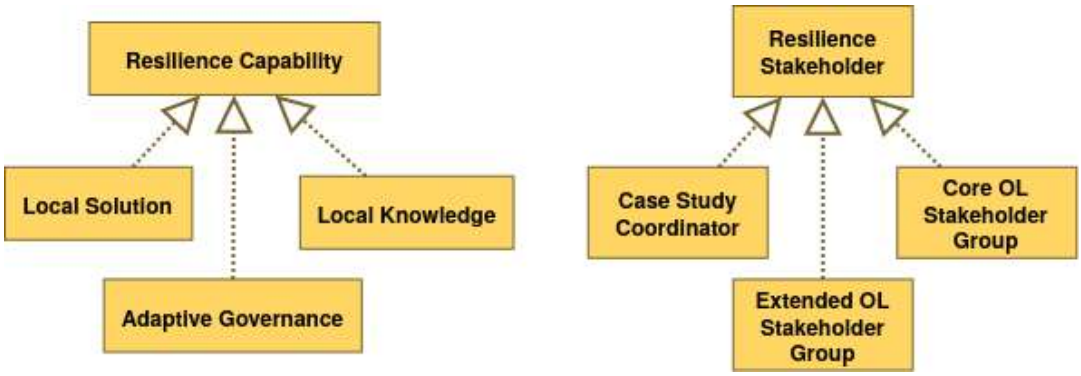

Figure 9: Terminological hierarchy with root terms Resilience Capability and Resilience Stakeholder

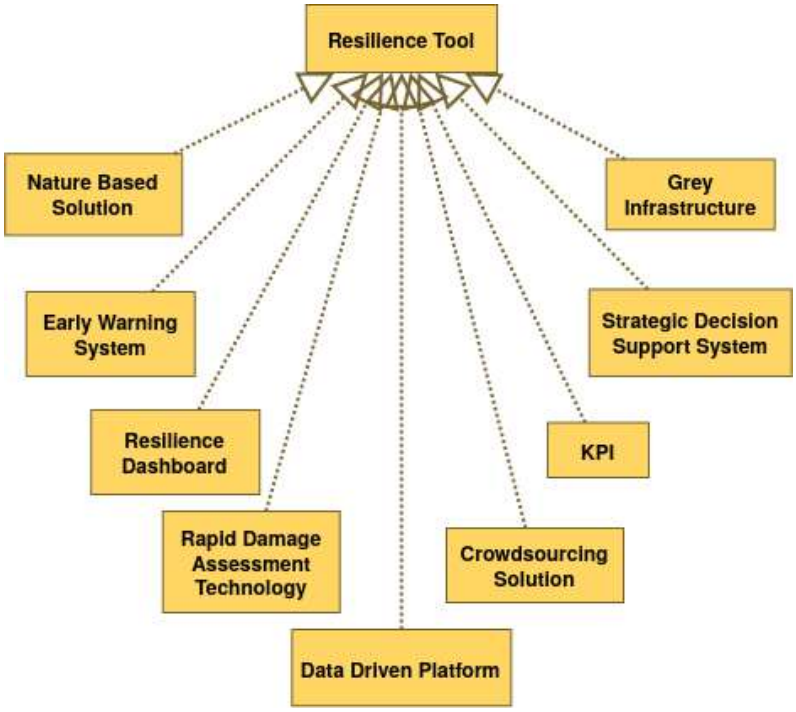

Figure 10: Terminological hierarchy with root term Resilience Tool

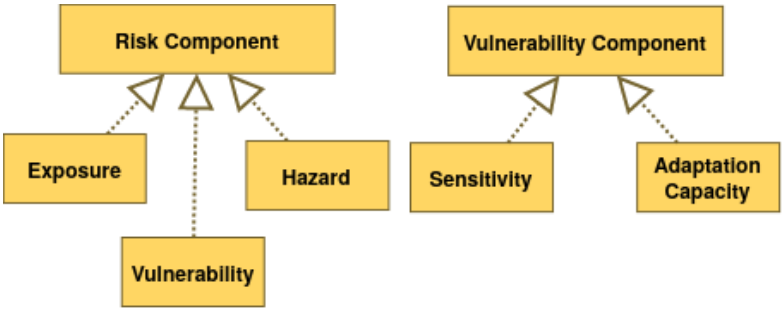

Figure 11: Terminological hierarchy with root terms Risk Component and Vulnerability Component

Figure 12 shows a partial, possible ontological description of how one of the proposed Open Labs for the project could be: the case of the natural park of Baixa Limia-Serra Do Xurés, in Galicia, Spain. This example illustrates how the scenario would be modelled following the CIDOC CRM ontology, and then how those elements of more relevance in the SHELTER project would be described in more detail by linking them to one of the terms in the SHELTER ontology.

The model in the Figure shows an E7 Activity (actions intentionally carried out by actors), which is the Open Lab being described. This fact is modelled by linking the activity with its SHELTER Type (Open Lab) by means of the P2 has type property. The activity includes two participants who are instances of the E74 Group class (gatherings or organisations

of humans, or groups which act collectively). Those two instances, Land Owners and a Galician Emergency Agency, have specific types in SHELTER: respectively Extended OL Stakeholder Group and Core OL Stakeholder Group.

The rest of the model suggests how other relevant elements from the Open Lab (location, knowledge used, activities included) could be modelled by following the CIDOC CRM ontology, and how some of the classes chosen can be linked to SHELTER Types. The classes of CIDOC CRM that could be linked to the different SHELTER Types have been suggested in Table 2. This example illustrates how the approach chosen for the SHELTER Ontology can be used in a formal context where the CIDOC CRM ontology is central, so the modellers have some knowledge about CIDOC CRM. However, this is not the only way to use the ontology. In less formal contexts, simply using the controlled terms in the vocabulary instead of possible synonyms can be enough to make it easier, for instance, to annotate and then facilitate the search and retrieval of documents.

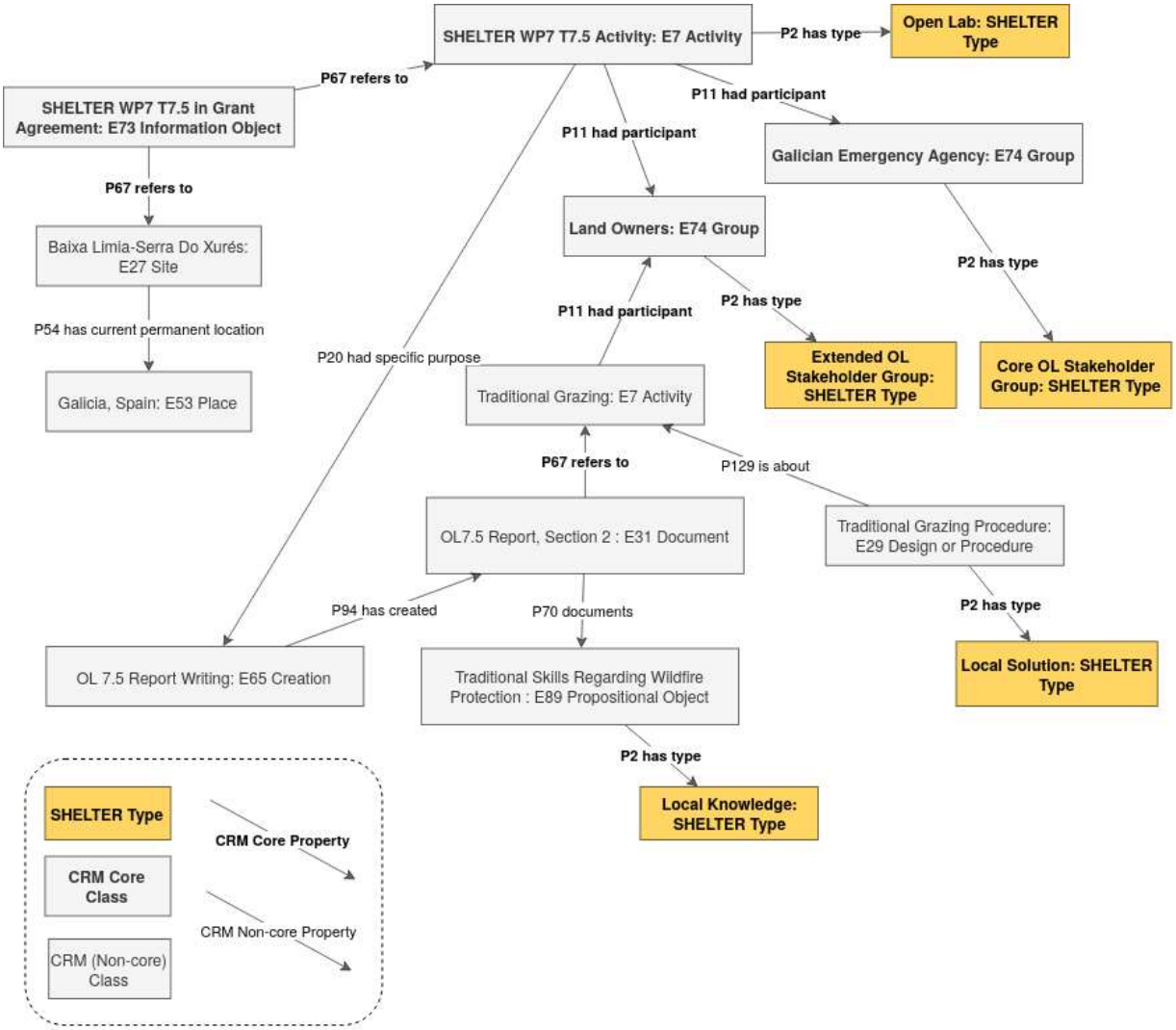

Figure 12: Partial modelling of one of the proposed Open Labs in CRM that illustrates how the SHELTER types defined in the ontology can be used

4.3.1 SHELTER core vocabulary

Every term in the SHELTER ontology is part of the SHELTER core vocabulary. These terms are defined in Table 3.

Term	Definition
Adaptation Capacity	The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences [7].
Adaptive Governance	It is a concept from institutional theory that deals with the evolution of institutions for the management of shared assets, particularly common pool resources and other forms of natural capital. Adaptive management involves adjusting approaches in response to observations of their effect and changes in the system brought on by resulting feedback effects and other variables [8, 9].
Best Practice	Validated and demonstrated good practices on adaptive governance for cultural heritage management, local knowledge and historical events [10].
Building Back Better (BBB)	The use of the recovery, rehabilitation and reconstruction phases after a disaster to increase the resilience of nations and communities through integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems, and into the revitalisation of livelihoods, economies and the environment [11].
Case Study Coordinator	Is the liaison between the Open Labs and the technical partners. SHELTER identifies one Partner responsible for coordinating a specific Open Lab, which reports on progress, defines the roadmap and monitors the activities [12].
Climate Change Adaptation	The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects [13].
Co-creation Strategy	A form of collaborative innovation. In SHELTER is applied to Open Labs by sharing, exchanging and improving knowledge and ideas to develop new concepts, solutions and products tailored to their specific Historic Areas [10].
Community Based Approach	A community-based approach is a way of working that is based on an inclusive partnership with communities of persons of concern which recognises their resilience, capacities and resources [14].
Core OL Stakeholder Group	Committed to the Open Lab objective. Participate and share knowledge in the Open Lab local workshops and, on voluntary basis, execute actions set in those workshops [12].
Crowdsourcing Solution	Social media data engine able to fetch in real time social media data related to historic areas and automatically classify the content using advanced text analytics, image processing and deep learning algorithms aimed to extract: meaningful information related to emergency situations, early warning signals, and data to complement damage assessment [10].
Cultural Heritage	Cultural heritage includes tangible cultural heritage, such as movable cultural heritage (paintings, sculptures, coins or manuscripts), immovable cultural heritage (monuments, archaeological sites, and so

	on) and underwater cultural heritage (shipwrecks, underwater ruins and cities) and intangible cultural heritage (oral traditions, performing arts, rituals) [15].
Cultural Heritage Management (CHM)	A 'management system for cultural heritage' helps to conserve and manage a given property or group of properties in a way that protects heritage values, and, where possible, enhances wider social, economic and environmental benefits beyond the confines of each property Managing heritage sites act as a link between the national (most often - public) heritage institutions, cultural heritage consumers (tourists) and local community [16, 17].
Cultural Resilience	How historic areas addresses social inclusion and supports social and technical innovation through cultural identity, local knowledge, intangible CH and openness to exploring novel pathways [18].
Cultural Values	The importance of a site as determined by the aggregate of values attributed to it, also known as "cultural significance". Cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations [19].
Data Driven Platform	A multiscale data platform that will be based on existing knowledge and existing data infrastructures to support evidence-based diagnosis, decision making, implementation and monitoring [10].
Disaster Risk Management (DRM)	Is the application of disaster risk reduction policies and strategies, to prevent new disaster risks, reduce existing disaster risks, and manage residual risks, contributing to the strengthening of resilience and reduction of losses [11].
Disaster Risk Management (DRM) Phase	A part of disaster risk management when seen as a sequence of activities and actions which combine, from a management perspective, prevention, mitigation and preparedness with response [11].
Disaster Risk Reduction (DRR)	Is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development [11].
Early Warning System	An integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events [11].
Economic Resilience	How the creation of a different sort of local economy can positively stewards the local environment and resources to enhance biodiversity, cut carbon dependence and creates meaningful locally based livelihoods [18].
Emergency	Emergency is a term describing a state. It is a managerial term, demanding decision and follow-up in terms of extra-ordinary measures [20].
Environmental Resilience	How the creation of a different sort of local economy can positively stewards the local environment and resources to enhance biodiversity, cut carbon dependence and creates meaningful locally based livelihoods [18].
Exposure	The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas [11].

Extended OL Stakeholder Group	Have specific knowledge or assets. Occasionally participate and share knowledge in the Open Lab local workshops and, on voluntary basis, may execute actions set in those workshops [12].
FAIR Principles	SHELTER project builds on the FAIR (Findable, Accessible, Interoperable and Re-usable) principles. Findable means that the data must be discoverable. The principle of Accessibility stipulates that datasets should be accessible through a clearly defined access procedure. Interoperable means that the dataset should be available in a standard data format and exposed by a standard data access service. Reuse ensures that data can be reused for purposes other than it was initially created for [21].
Glocal approach	Reflecting or characterised by both local and global considerations. In SHELTER it has been used to identify user requirements looking at both the bottom-up (local) and top-down (global) levels [22].
Governance and Institutional Resilience	How links and partnerships are created and managed with support networks and across sectors (including public sector/government, research and business) [18].
Grey Infrastructure	Familiar urban infrastructure such as roads, sewer systems and storm drains. Such conventional infrastructure often uses engineered solutions typically designed for a single function [23].
Hazard	An unforeseen and often sudden event that causes great damage, destruction and human suffering. Though often caused by nature, disasters can have human origins [24].
Heritage Attribute	A characteristic or quality of an artefact, object, property or ensemble which is considered an important legacy from a cultural, historic and/or natural perspective.
Historic Area	A site whose material, cultural and natural values are seen from a broad perspective, including historic buildings, archaeological sites, cultural landscapes and intangible heritage.
Intangible Heritage	Practices, representations, expressions, knowledge, skills as well as the instruments, objects, artefacts and cultural spaces associated therewith that communities, groups and, in some cases, individuals recognise as part of their cultural heritage. This intangible cultural heritage, transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity [25].
Key Performance Indicator (KPI)	In the SHELTER context, Key Performance Indicators are provided for baseline establishment, resilience monitoring, co-monitoring of the project results in Open Labs to measure the success of adequate climate change adaptation and disaster risk management policies and strategies, the integration of collaborative early warning systems, the adoption of appropriate contingency plans, emergency procedures and adaptive solutions reconstruction of those elements affected after disasters [10].
Local Knowledge	Local Knowledge refers to the set of knowledge, skills, know-how and practices that societies have developed over time, through a long-lasting interaction with their environment [26, 27].
Local Solution	Cost-effective existing and innovative solutions based on technology, vernacular architecture, information communication technologies,

	nature-based solutions and trans-boundary governance and tailored for the historic built environments and co-created in the Open Labs [10].
Natural Heritage	Natural heritage includes natural sites with cultural aspects such as cultural landscapes, physical, biological or geological formations [15].
Natural Heritage Management	The most basic requirement is that the management plan describes the overall goal of the protected area, details the specific objectives for the natural and cultural resources within the protected area and identifies the management activities needed to achieve those objectives. An effective management system could include: (a) a thorough shared understanding of the property by all stakeholders; (b) a cycle of planning, implementation, monitoring, evaluation and feedback; (c) the monitoring and assessment of the impacts of trends, changes, and of proposed interventions; (d) the involvement of partners and stakeholders; (e) the allocation of necessary resources; (f) capacity-building; and (g) an accountable, transparent description of how the management system functions [28].
Nature Based Solution (NBS)	Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. Nature-Based Solutions therefore provide multiple benefits for biodiversity. Any approaches that do not improve biodiversity, are not based or delivering on a range of ecosystem services, are not Nature-Based Solutions [29].
Next Practice	Innovative practices (not totally documented but promising and inspiring) related with climate change adaptation and disaster risk management in cultural heritage [10].
Open Lab	Open Labs are representative case studies providing a framework for knowledge extraction and generation, citizen´s engagement, co-creation, evaluation and demonstration, long- term thinking and learning environments [10].
Post-Disaster Needs Assessment (PDNA)	A government-led process to develop and use common assessment and recovery planning approaches in post-crisis settings supported by the United Nations system in cooperation with the World Bank and the European Union. The main goal is to assess the full extent of a disaster's impact, define the needs for recovery, and, in so doing, serve as the basis for designing a recovery strategy and guide donors' funding. A PDNA includes an emphasis on reducing future disaster risks and building resilience [30].
Preparedness	An explicit set of actions that are taken as precautionary measures in the face of potential disasters [24].
Prevention	Activities aimed at avoiding or minimising the possibility of damage occurring in the wake of a disaster [24].
Rapid Damage Assessment Technology	Web data platform making use of a combination of Earth Observation imagery and data collected from ground sources for damage assessment in both urban and rural environments [10].
Recovery	Activities aimed at restoring their lives and the infrastructure that supports them [24].
Resilience	The ability of an historic urban or territorial system-and all its social, cultural, economic, environmental dimensions across temporal and

	spatial scales to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and use it for a systemic transformation to still retain essentially the same function, structure and feedbacks, and therefore identity, that is, the capacity to adapt in order to maintain the same identity [18].
Resilience Activity	Activities related to forward-looking planning and long-term capital investments with the aim of reducing disaster related risks.
Resilience Approach	Approaches used in the Shelter project to improve the resilience level of a system, specifically Historic Areas, considering participatory mechanisms with all the stakeholders involved, co-creation and replicable practices.
Resilience Capability	Capability to increase the effectiveness of the adaptation and preparedness strategies through the inclusion of local and traditional knowledge and skills with existing practices.
Resilience Dashboard	Cultural heritage specific dynamic management tools for preparedness and response phases that will connect multi-hazard early warning systems and rapid damage assessment technologies, with smart dashboard for social data filtering and visualisation [10].
Resilience Incremental Documentation (ID)	Multiscale incremental documentation strategy that will store in the multiscale data model the results of the whole process to make it easily accessible when required.
Resilience Stakeholder	People who are affected by hazards and people who can influence or contribute (either positively or negatively) to any DRM phase and the outcomes or results of a particular process. This includes the community, private and public sectors.
Resilience Tool	Adaptable and replicable tools for all the CRM phases, including existing and innovative solutions that will be generated in Shelter project to protect cultural heritage from climate change impacts and disaster risks.
Response	Immediate assistance to impacted people to maintain life, improve health and support the morale of the affected population [24].
Risk Component	One of the elements used to determine a risk, being risk the probability of harmful consequences, or expected losses, deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged resulting from interactions between (natural, human induced or man-made) hazards and vulnerable conditions in a given area and time period [31].
Multiscale Strategy	Cultural heritage, in all its forms and nature, has a multiscale character. To structure the SHELTER conceptual framework, artefacts, buildings and archaeological sites have been grouped and named as the object/building scale, while neighbourhoods/districts, cities and regions have been assigned to the urban/territorial scale.
Sense of Place	It includes some subjective perceptions of the place and feelings originated by it. As individuals' factors, perceptions and feelings are variable and can be influenced by different elements according to gender, social issues, ages, beliefs, or education. They include some relevant emotional, unaware but cultural feelings as the sense of roots, continuity and ownership with relevant effects on personal and social solidity, solidarity, continuity and socio-cultural cohesion [26].
Sensitivity	It is the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. The effect may be direct (e.g., a

	change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea level rise) [32].
Social Resilience	How individual's physical and psychological well-being are addressed within the historic area and strong and healthy personal relationships, connection to culture and nature and learning and sharing new skills are enabled [18]
Strategic Decision Support System	Proactive strategic and spatially explicit decision-making tools to support risk assessment and iterative adaptation and reconstruction planning [10].
Tangible Heritage	Movable cultural heritage (paintings, sculptures, coins, manuscripts), immovable cultural heritage (monuments, archaeological sites, and so on) and underwater cultural heritage (shipwrecks, underwater ruins and cities) [15].
User Requirements (UR) Capture	The collection of key stakeholder requirements, as regard with Climate Change Adaptation, Disaster Risk Management and Cultural Heritage Management, through Use Case Scenarios review, ex-post analysis and interactive workshop with international experts [22].
Vulnerability	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt [32].
Vulnerability Component	An element considered when evaluating the vulnerability of a system, being vulnerability the propensity of exposed elements such as human beings, their livelihoods, and assets to suffer adverse effects when impacted by hazard events.
Workshop	In SHELTER, the Open Labs strategy is articulated around six-monthly Workshops that will provide local knowledge extraction, collaborative cultural heritage characterisation, co-creation and final validation [10].

Table 3: Definitions for the SHELTER vocabulary

The SHELTER core vocabulary listed in Table 3 has been also included in the SHELTER Wiki [33], conceived as a tool to be used not only by SHELTER Open Labs, but available for the general public. Each term has been listed with its own definition, an icon to facilitate the visualisation and recognition of the term, and tags (e.g. types of hazard addressed, relevance for the SHELTER Open Labs) have been added to better filter the vocabulary contents.

5 Building the relevant regulatory frameworks for resilient cultural heritage protection against natural hazards

5.1 Setting the scene

The United Nations Educational, Scientific and Cultural organisation (UNESCO) is an international organisation, part of the United Nations system. As host of the secretariat of the World Heritage Convention, as well as knowledge relating to disaster risk reduction, UNESCO plays the key role of bridging the scientific work in the SHELTER project with the target beneficiaries in selected countries (Research and Technological Development specialists, site managing authorities, emergency managers and civil society, etc.). Through its institutional and operational setting (field offices, designated and affiliated sites, Category I and II centres, UNESCO Chairs and Networks), UNESCO leverages and maximises the relevance, applicability and sustainability of the results, but also brings its knowledge in the field of disaster and climate risk management. UNESCO has been engaged for decades in the study of natural hazards and the mitigation of their effects. UNESCO has international scientific programmes related to science policy, water, ecology and the ocean that deal with the study of natural hazards and the mitigation of their effects.

World Heritage sites, Geoparks and Biosphere Reserves are exposed to the impacts of natural hazards, which threaten their integrity and value [1]. Many of those sites do not have any established policy, plan or process for managing, i.e. reducing risks associated with disasters [1]. Moreover, existing national and local disaster preparedness and response mechanisms usually do not include heritage expertise in the site operations [2-3]. As a result, hundreds of sites are critically exposed to potential hazards, while communities worldwide are not harnessing the full potential of their heritage, either tangible or intangible, for reducing disaster risk. Therefore, UNESCO has started working with other partners to integrate heritage concerns in DRR policies and programmes, and to strengthen preparedness for disaster risks at the sites. Actions undertaken include the development of a Strategy for Reducing Risks from Disasters at World Heritage Properties [4], the organisation of technical workshops and the publication of resource materials, as well as the provision of International Assistance mechanisms.

UNESCO, within the SHELTER project framework, undertook a comprehensive review and codification of existing knowledge in DRM in CH. The objective was to build a global regulatory framework database as a common reference for defining replication conditions.

5.2 Methodology

The exercise consisted not only in mapping but also in analysing the last 20 years of DRM frameworks. Therefore, the performed literature review is not exhaustive since it covers essentially documents that are available on the Internet, as well as documents that were published mostly within the past 20 years. Another valuable source of information was the consultations with CH experts belonging to the UNESCO International networks and UNESCO National Commissions networks. Some of those experts have been invited and gave a significant contribution during the SHELTER GLOCAL user requirements workshop held December 2019 in the premises of the UNESCO Regional Bureau of Science and Culture for Europe, in Venice, Italy, and organised within the framework of SHELTER project by UNESCO with the task 6.1 partners (ULIEGE and CRCM). More information can be found in the deliverable *D6.1 Glocal user requirements* [5]. The results have been also crosschecked with the ARCH H2020 project (GA Number 820999) deliverable *D7.1 State-of-the-Art Reports of concepts, approaches, standards and technologies* [6].

The CH global database ranges between policies, regulations, guidelines, methodologies, strategies, protocols, studies, regulatory and legislative framework. The documents considered are both legally binding and not binding. For the international conventions, it is only legally binding if countries ratify it and countries are free to do so or not. Specifically, UNESCO tried to analyse the documents referring to the DRM cycle: disaster risk reduction, emergency preparedness and response, post-disaster reconstruction. This specific purpose permitted to sift further the results, dismissing 32 documents (out of 150) not relevant to CH, to the DRM cycle or outdated. The great majority of the documents analysed addressed immovable (built) CH, while some of the Intangible CH documents have also been taken into consideration (e.g. Convention for the safeguarding of the Intangible Cultural Heritage [7]).

In respect to the general methodology explained in Section 3, the codification of the 150 documents dedicated to developing a regulatory framework database required few additions and elements specification. For example, initially it has been decided to replace the word “regulation” with “document” because most of the documents included in the review are not regulations or any other type of legally-binding documents. The column “type of regulation” has been divided into 2 columns: one with the type of document (e.g. guideline, manual, methodology, study, tool, policy, regulation) and another with the topic of the document (e.g. disaster risk management, emergency preparedness, post-disaster recovery, risk assessment, multiple). It is important to highlight that a document can have more than one promoter. It has been also decided to categorize the documents as International, European but also by “country” as many are the national documents found. Regarding the "document scale" the option “site” has been added, because often it is the object of analysis when UNESCO is the promoter. Also having a "region" class for country-level documents it is important because sometimes a given

document is only applicable in a given region (e.g. few Italian laws that were issued to address the recovery after the 2016 earthquake). A column referring to the geographical "document scope" for the document has been added, which is different from "document scale". In document scale "cross-regional" refers to international documents that can be applied in multiple countries and regions. In this context the scale national "country" and the scope "site" and "multiscope" has been added. In the class document scope, there are only elements that can be related to cultural heritage (e.g. sites, buildings, settlements, landscapes) even though the document itself may address other types of elements. Regarding the Quadrants "site" has been added to QA and QC to replace the "district" in the original template (e.g. QA- specific hazards and building/site scale, -QC- non-specific hazards and building/site scale).The results of this extensive analysis are presented in graphical form in section 5.3 in the following three sections:

- International (section 5.4)
- European (section 5.5)
- National (section 5.6) dedicated to Open Lab (OL) case study countries.

Despite the division of levels and DRM topics, some of the documents referred in one sub-section can be seen to also address the topic of another sub-section. In such cases, most of the corresponding documents are referred only in the first relevant sub-section. Still, when appropriate, some documents are also referred in multiple relevant sub-sections.

A final section (section 5.7) highlights the gaps that emerged from this desktop analysis and the future steps that the SHELTER partners decided to take in order to discuss, interpret and confirm the collected results with the relevant stakeholders that will attend the future cycle of OL workshops (WP7). This will help to feed into the analysis and codification of knowledge.

Figure 13 shows the structure of the data gathering template that has been used to build the relevant regulatory frameworks for resilient cultural heritage protection against natural hazards. Annex I show the table with all the 150 references collected and codified according to this structure.

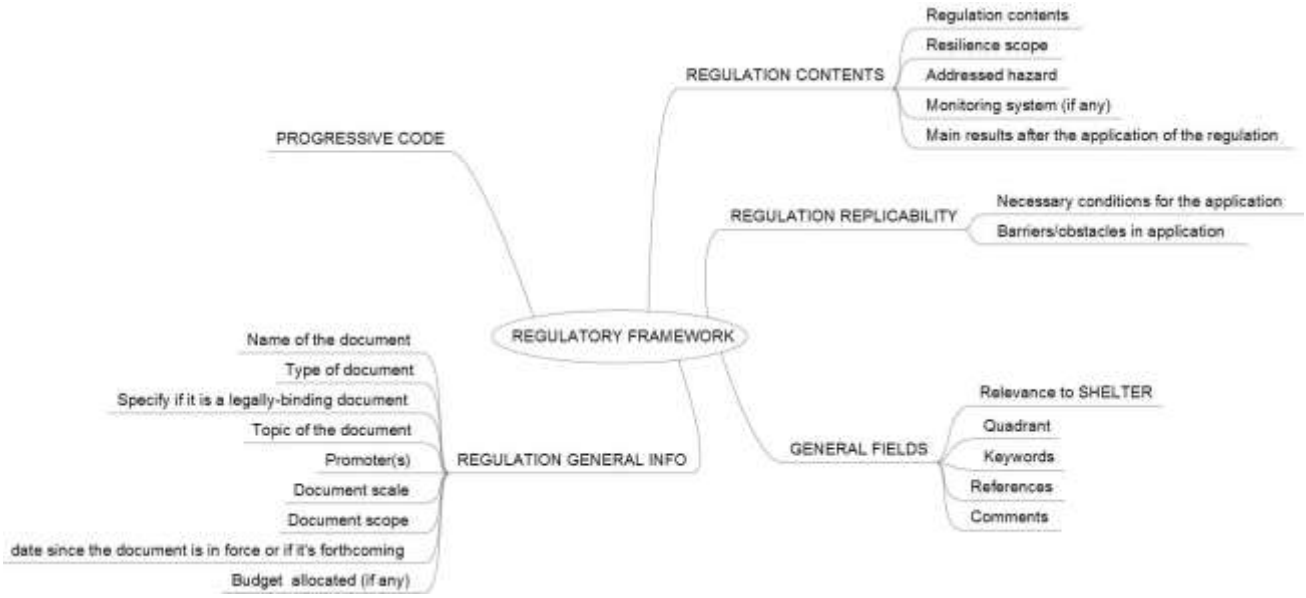

Figure 13: Structure of the "regulatory framework" data gathering template

5.3 Graphical representation of the results

As mentioned in the previous paragraph, the following results concerns only the 118 documents considered relevant to cultural heritage and DRM, leaving out the 32 documents not relevant to SHELTER project.

Error! Reference source not found. represents the various types of analysed documents. The majority of them are either strategies or policies. Among other type of documents there are directives, meetings and concept papers, but they have been grouped together for the analysis, being few compared with the total number.

All the documents reviewed have been classified by the scale they are referring to. In Figure 15 can be observed that the majority of analysed documents refer to a cross-regional scale because they can be applied in multiple countries and regions. The latest represented scale is 'building and district' since a national regulation is generally applied to the whole nation and not to a single building or district.

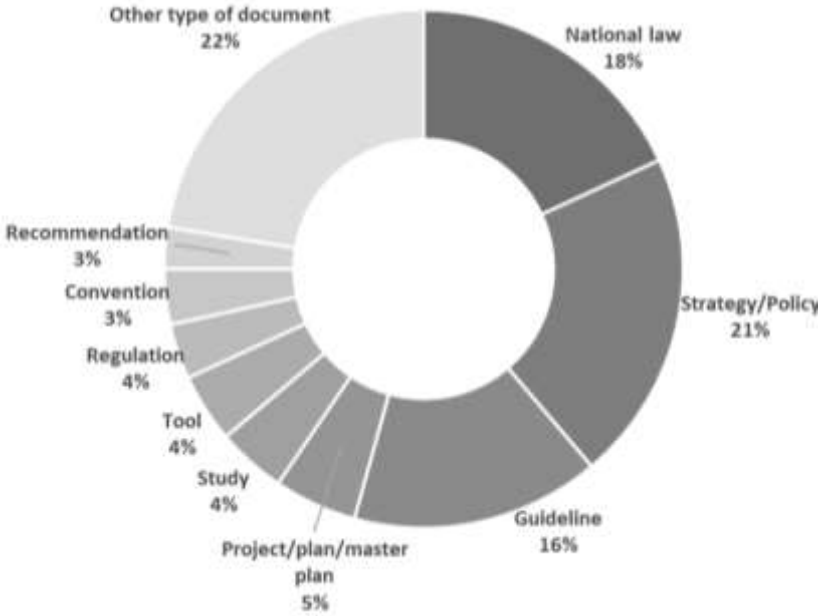

Figure 14: Type of analysed documents in regulatory framework research

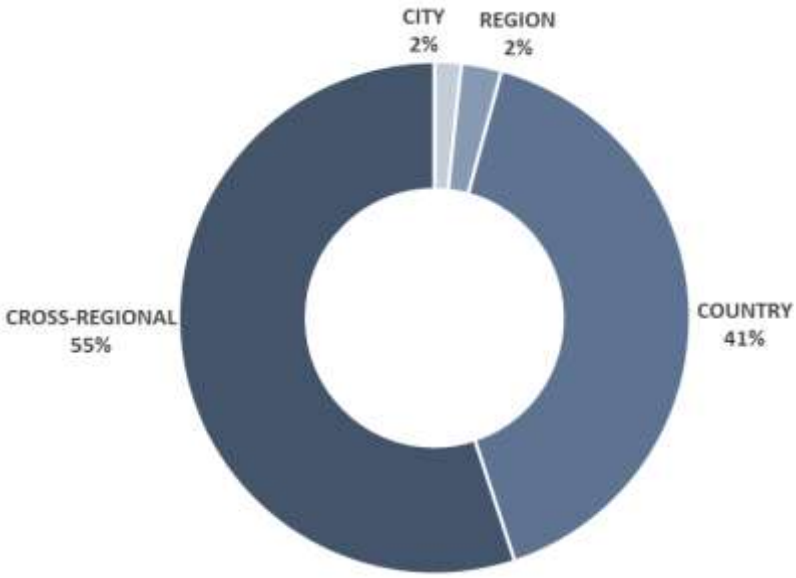

Figure 15: Spatial scale distribution that documents refer to

The analysis focused also on the hazards to which documents refers to. Figure 16 shows that more than half of the documents collected refers to a non-specific hazard and 11% of them concerns more than one hazard (i.e. classified as multi-hazards). It needs to be specified that the documents addressing non-specific hazards also deal with multi-hazard but they are not specifically referred. Therefore, it is possible to say that 62% of documents concerns with multi-hazards.

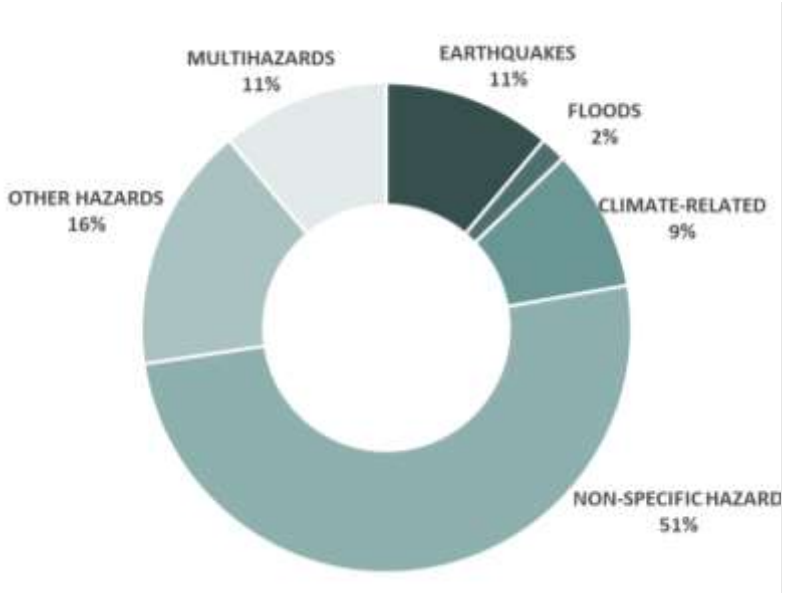

Figure 16: Hazards addressed by the analysed documents in regulatory framework research

As seen in Figure 16, subsidence, heat waves and storms are not mentioned. No relevant specific documents have been found addressing them directly, however they are present in the multi-hazards composition, as it can be seen in Figure 17, where 11% of items classified as multi-hazards are further specified.

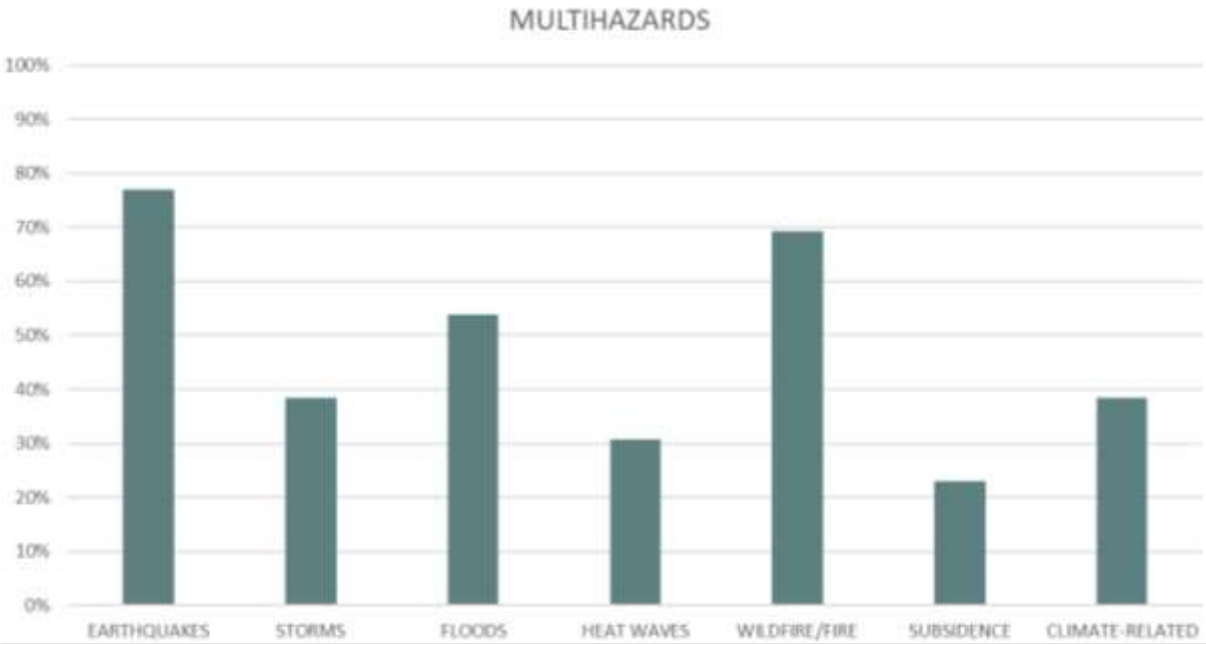

Figure 17: Specification of multi-hazards' composition in regulatory framework research

In addition to the type of hazards analysed in the different documents, it is possible to define a specific quadrant in which insert them, referring to the object scale they deal with. Results are shown in Figure 18. 30% of items refers to a specific hazard and a building/site scale (QA) and 36% refers to non-specific hazards and building/site scale (QC), while specific hazards and urban/territorial scale (QB) and non-specific hazards and urban/territorial scale (QB) count respectively for 6% and 15%.

When it comes to the resilience scope, the cultural feature has resulted in being the most prevalent as shown in Figure 19.

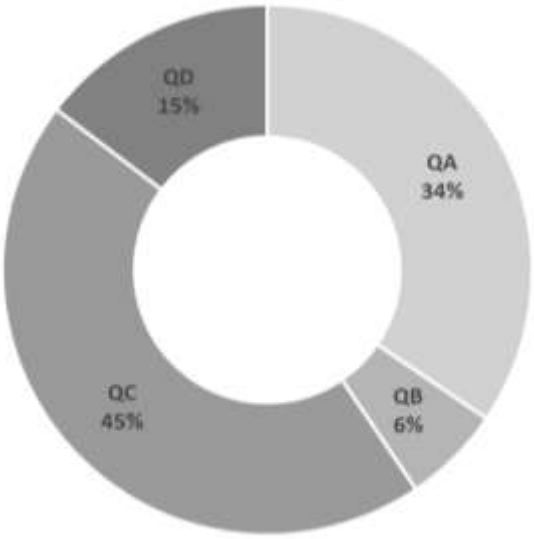

Figure 18: Document's resilience conceptual framework distribution

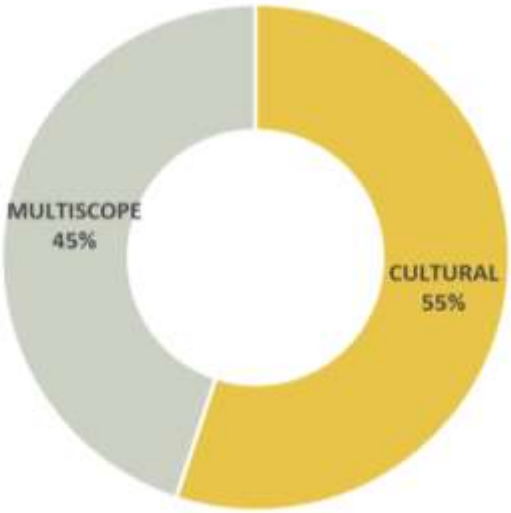

Figure 19: Resilience dimensions that analysed documents refer to in regulatory framework research

Due to the focus on cultural heritage, it is not surprising that the cultural resilience scope covers 55% of the whole documents collected, and it is also mentioned among the other 45% of multi-scope resilience, showing that 98% of multi-scope resilience items have cultural characteristics, followed by 94 % environmental (Figure 20).

Figure 21 summarises the documents' relevance to SHELTER project, showing also the non-relevant ones.

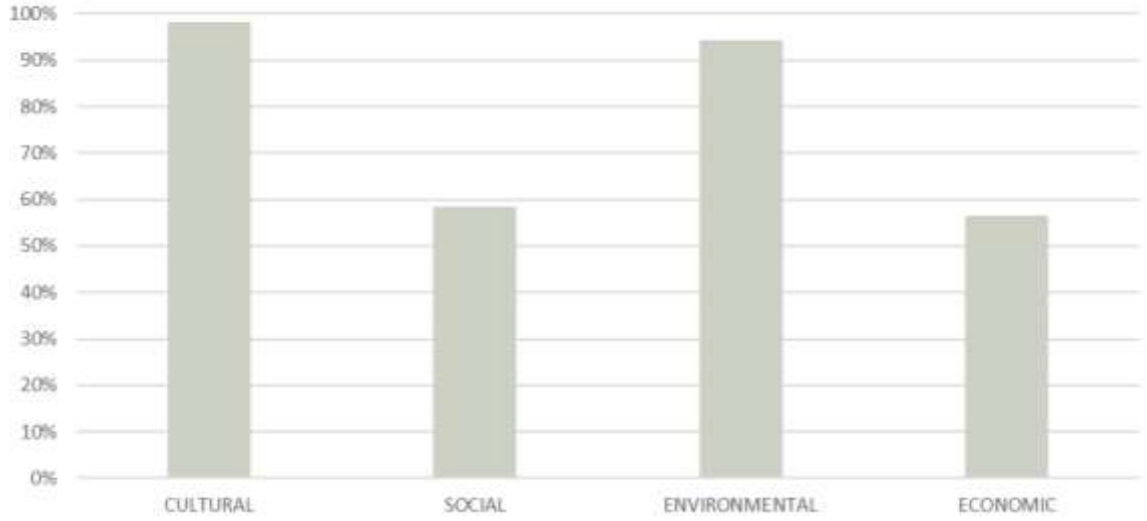

Figure 20: Content specification if multi-scope

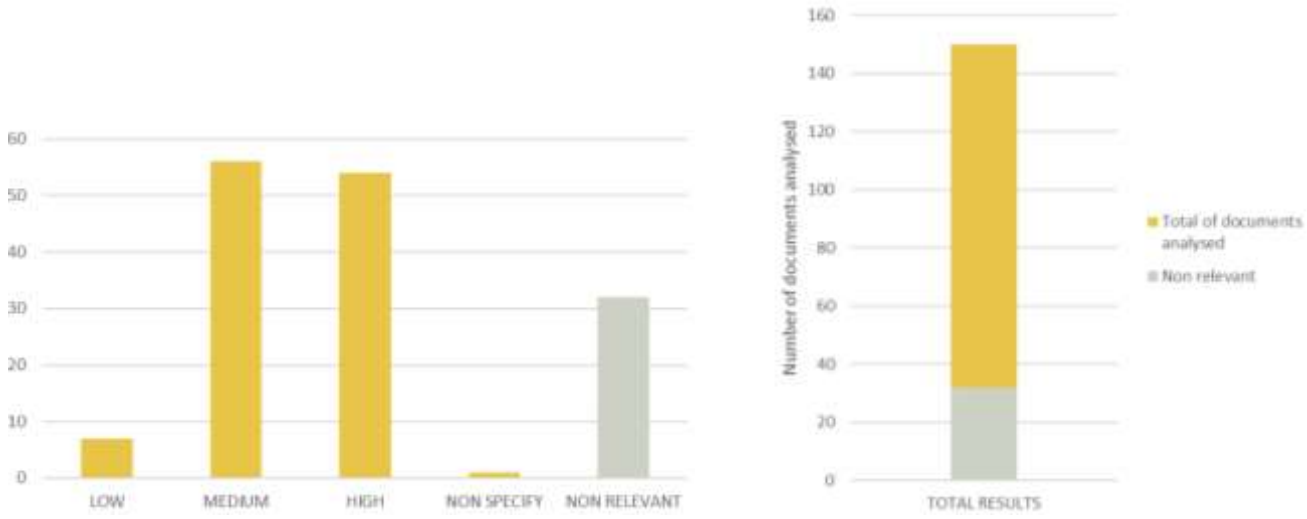

Figure 21: Document's relevance to SHELTER projects

The share of documents collected according to the spatial scale (e.g. national, European and international level) and the type of enforcement (e.g. legally binding or not) is presented in Figure 22.

Lastly, keywords have been analysed. Figure 23 shows that "*world heritage*" and "*climate change*" have been the most used. The font size represents the use frequency.

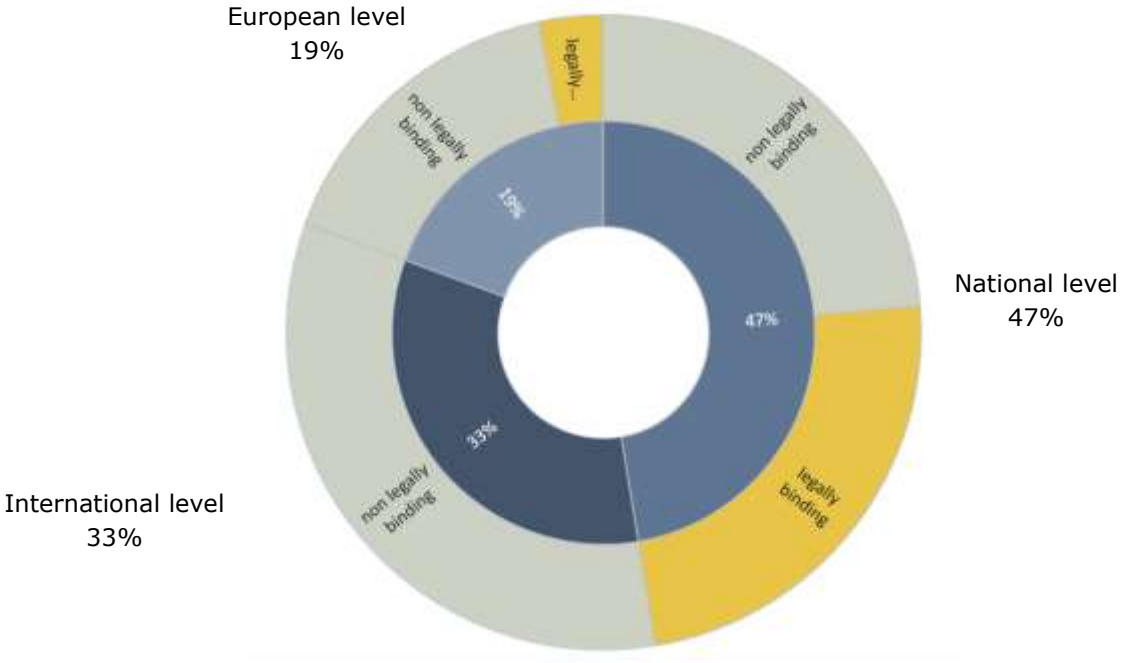

Figure 22: International, European and national level / legally and non-legally binding for the documents collected

Figure 23: Main keywords used in the regulatory framework

5.4 Results at international level

A total of 118 relevant references were collected and analysed, 39 of which are documents produced at International level.

Most of the documents reviewed in this section were issued by intergovernmental and international nongovernmental organizations concerned with CH, such as the United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), the International Council of Monuments and Sites (ICOMOS) and the International Committee of the Blue Shield (ICBS), among others.

Even though the list of documents that was analysed is not exhaustive, it provides a wide-range overview of the landscape of available guidelines and policies published by international organizations that address DRM in CH.

5.4.1 Addressing DRM, DRR and prevention

UNDRR (former UNISDR)

The Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) [8] is a global agreement to reduce and prevent disaster risks across the globe that was adopted in 2015 as the outcome of stakeholder consultations and intergovernmental negotiations, supported by the United Nations Office for Disaster Risk Reduction (UNDRR). The SFDRR is the third United Nations framework addressing DRR (following the 1994 Yokohama strategy [9] and the 2005 Hyogo framework [10]) and makes clear reference to the need to protect CH, unlike previous frameworks where mention of CH was minimal. In particular, this issue is referred to the expected outcome of the SFDRR which is expressed as being the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries. In addition, the protection of CH was included in the guiding principles related to the implementation of the SFDRR, namely in the key activities relevant to the four priorities that were identified. For example, under Priority 1, which targets the enhancement of our understanding of disaster risks, countries are required to evaluate systematically, record, share and publicly account for disaster losses and understand the economic, social, health, education, environmental and CH impacts. Likewise, under Priority 3, which addresses investments in DRR for resilience, countries are required to protect or support the protection of cultural institutions and sites of historical, CH and religious interest. Considering this, even though the SFDRR is a non-binding soft-law framework, it is expected to influence the practice of UN Member States regarding disaster risk reduction, namely for CH.

UNESCO

UNESCO has published numerous conventions, declarations, recommendations and resolutions addressing CH protection [10]. With respect to specific issues related to DRR for CH, reference is made to the 2007 *Strategy for Risk Reduction at World Heritage Properties* [11] that was developed to mirror and adapt the guiding principles of the Hyogo Framework for Action 2005-2015 (HFA) [9] to the context of the preservation of World Heritage sites. The purpose of this *Strategy* was mostly twofold:

- To strengthen the protection of World Heritage and contribute to sustainable development by assisting Member States in integrating CH concerns into national disaster reduction policies and in incorporating concerns for disaster reduction within World Heritage management plans.
- To provide guidance to State Parties, the World Heritage Committee, the World Heritage Centre and the Advisory Bodies to integrate DRR into World Heritage strategic planning and management, including the allocation and use of Emergency Assistance under the World Heritage Fund.

The *Strategy* was structured to reflect and mimic the five "Priorities of Action" and the corresponding "Key Activities" of the HFA. As such, the *Strategy* also presented five "Objectives" and each of them was complemented by two "Priority Actions", thus replicating the model provided by the HFA and including adaptations to reflect specific concerns of World Heritage sites. As an example, reference is made to HFA's Priority for Action Nº 2 whose aim was to "identify, assess and monitor disaster risks and enhance early warning" and was replicated in Objective Nº 3 of the UNESCO *Strategy* whose aim was to "identify, assess and monitor disaster risks at World Heritage properties". One of the "Key Activities" of the HFA for this Priority for Action was to "develop, update periodically and widely disseminate risk maps and related information to decision-makers, the general public and communities at risk in an appropriate format". Similarly, for Objective Nº 3, the UNESCO *Strategy* established a Priority Action whose objective was to "develop a world heritage risk map at the global level or at regional levels to assist state parties and the committee to develop better responses".

In 2015, UNESCO adopted a resolution [12] proposing a *Strategy* to strengthen its action for the protection of culture and the promotion of cultural pluralism in the event of armed conflict. Two years later, UNESCO adopted an addendum to this *Strategy* that expands it by defining a strategic framework to deal with emergencies associated with disasters caused by natural and human-induced hazards [13]. The overall goal of the revised *Strategy* is to enhance the capacity of State Parties in successfully implementing the culture and heritage-related provisions of the SFDRR. As such, it proposes two overall objectives:

- Strengthen the ability of State Parties to prevent, mitigate and recover the loss of CH and diversity as a result of disasters caused by hazards.

- Incorporate consideration for culture into the DRR sector and humanitarian action related to disasters by engaging with the relevant stakeholders outside the cultural domain.

To achieve these objectives, the *Strategy* is also structured according to the Four Priorities of the SFDRR and, for each priority, it establishes a series of actions. The following list highlights some of the actions found to be more relevant to the context discussed herein:

- Priority 1 - Understanding disaster risk to culture.

  The *Strategy* highlights the importance of having baseline information about CH assets to enable the implementation of DRM in this sector. In this context, it refers the need to strengthen, centralize and share baseline information across relevant authorities and agencies, including up-to-date inventories and multi-hazard maps to establish the main features of the pre-disaster conditions of CH, and to assess the extent and the impacts in post-disaster scenarios. Furthermore, the *Strategy* also highlights the need to build the capacity of national authorities and relevant stakeholders for performing multi-hazard risk assessments for CH in order to effectively prioritize risks and inform emergency preparedness.

- Priority 2 - Strengthening disaster risk governance of the culture sector to manage disaster risk.

  The *Strategy* refers to the need to strengthen the integration of the culture and DRR sectors at all levels, in order to promote information and data sharing, develop culture-sensitive policies, and enhance coordination mechanisms among relevant institutions and actors in the implementation of DRR strategies and plans. Furthermore, the *Strategy* also refers to the need to engage in capacity-building assessment processes at the national level for DRR and emergency preparedness and response, to identify the specific needs of the culture sector and develop tailored capacity-building materials and tools, namely for national authorities, institutions as well as communities.

- Priority 3 - Investing in DRR of culture for resilience.

  The *Strategy* emphasizes the need to promote the broader inclusion of DRM as an integral component of CH site management plans, in particular when considering the low number of World Heritage properties that developed policies, plans and processes to manage potential disaster risks.

- Priority 4 - Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction of culture.

The *Strategy* reiterates the role of UNESCO in supporting and building the capacity of countries to plan and coordinate Post Disaster Needs Assessments for the culture sector, in particular by developing training materials developed based on the experience gathered so far.

Among other policy documents published by UNESCO regarding CH protection, a brief reference is also made to the 2015 *Recommendation concerning the protection and promotion of museums and collections, their diversity and their role in society* [10]. This *Recommendation* is one of the more recent documents that, within the scope of DRR and museum activities, refers that such activities should include the development of risk analyses for their collections, as well as emergency and preparedness plans.

On the specific issue of climate change impacts to CH, reference is made to the 2017 revision of UNESCO's 2008 Strategy for Action on Climate Change [14]. This new *Strategy for Action on Climate Change (2018-2021)* [15] is expected to support State Parties in taking urgent action to address climate change and its impacts through education, sciences, culture, information and communication, in line with their respective National Determined Contributions under the Paris Agreement adopted by the United Nations Framework Convention on Climate Change [16], and in the overall context of the 2030 Agenda for Sustainable Development [17]. Among the thematic actions that are proposed by the *Strategy*, an explicit recommendation is made regarding the importance of promoting cultural diversity and CH safeguarding for climate change mitigation and adaptation. Furthermore, the *Strategy* recognizes the links between climate change and DRR and the need to increase the resilience of communities to climate change and extreme weather phenomena through systematic planning and capacity development.

With respect to guidelines, reference is made to the 2010 resource manual *Managing Disaster Risks for World Heritage* [18] which is one of the publications of a series developed by a joint undertaking involving the three advisory bodies of the World Heritage Convention (ICCROM, ICOMOS and the International Union for Conservation of Nature) and the UNESCO World Heritage Centre. This manual provides the necessary methodological framework to identify, assess, and mitigate disaster risks in CH properties, to prepare and respond to emergency situations in CH properties, and to recover and rehabilitate CH properties after a disaster. Globally, these topics are discussed within the overall objective of developing an adequate DRM plan for CH properties. Nevertheless, for the specific aspects related to risk assessment and management, aside from the methodological guidance, this manual provides little practical tools for the implementation of risk assessments. In particular it only briefly refers the ABC risk assessment method originally developed for museum collections [19]. From a methodological point of view, this manual also complements the 1998 publication *Risk Preparedness: A Management Manual for World Cultural Heritage* [20] by ICCROM,

ICOMOS and the World Heritage Centre, and further emphasizes the increasing importance of these topics.

ICOMOS

ICOMOS has also produced numerous Charters, Declarations, Recommendations and Resolutions addressing the topic of CH protection [21]. Among those more relevant to issues related to DRM, reference is made to the 2010 *Lima Declaration for Disaster Risk Management of Cultural Heritage*. Among other aspects, this *Declaration* emphasizes the need to promote the integration of CH protection into the broader disaster management field, and the fact that governments should strengthen the institutional support and governance for disaster preparedness through adequate regulations. Furthermore, the *Declaration* also highlights the importance of adopting and implementing comprehensive policies, procedures, and legal measures to integrate CH in disaster reduction programmes and to include risk management plans as part of the management system for heritage properties. In this context, the more recent 2017 *Guidance on Post Trauma Recovery and Reconstruction for World Heritage Cultural Properties* [22], that focusses mostly on post-disaster recovery issues , also stresses the importance of risk identification and assessment for CH, highlighting that these activities need to be routinely updated and need to account for both tangible and intangible attributes.

In the particular context of historic city centres and towns, reference is also made to the 2011 *Valletta Principles for the Safeguarding and Management of Historic Cities, Towns and Urban Areas* [21] and to the 1987 *Charter for the Conservation of Historic Towns and Urban Areas* [21]. These two documents frame the importance of protecting historic towns and their settings from the effects of climate change and from increasingly frequent natural disasters and highlight the fact that developing adequate conservation plans is important to improve risk management, among other things. In addition, the *Valletta Principles* also emphasize that disaster mitigation and preparedness require a comprehensive assessment of risks to both the site and its occupants and visitors, and that detailed rescue and response plans should be developed. These *Principles* also mention that local communities should be involved in the preparation and implementation of risk management plans, and in all stages of disaster recovery. Moreover, they also refer that scientific research and technical studies, educational and training programmes associated with risk management and disaster recovery for CH should be developed.

On the specific issue of climate change impacts to CH, ICOMOS also produced the 2007 *New Delhi Resolution Impact of Climate Change on Cultural Heritage* [23]. This *Resolution* establishes a series of principles concerning the potential impacts of climate change in CH and acknowledges that analysing these impacts requires adequate and sustained research, studies and documentation involving the collaboration of experts from multiple disciplines. Among other aspects, the *New Delhi Resolution* refers to the need to assess risks to CH due to climate change and that such assessments should be

developed at the macro and micro levels for specific heritage sites. Furthermore, the *New Delhi Resolution* also refers that strategies for CH adaptation to climate change should be integrated into specific standards and protocols, emphasizing that CH needs and concerns should be mainstreamed into institutional processes and policies for DRR. Globally speaking, the *Resolution* also recommends that governmental and nongovernmental organisations, academic institutions and individuals involved in the conservation and protection of CH should integrate their actions into national and international protocols for DRR and CCA. Following a series of actions on this topic since then, ICOMOS has been advocating an approach to issues related to climate change that emphasizes the need to respond to the risks that climate change poses to CH, but also the fact that CH is a source of resilience and an asset to climate action, whose potential can be unlocked through better conservation and management. As a sequence, in 2017, ICOMOS adopted *Resolution 19GA 2017/30 Mobilizing ICOMOS and the cultural heritage community to help meet the challenge of climate change* [24] welcoming the adoption of the Paris Agreement and committing the organization to mobilize the CH community for climate action. The *Resolution* encouraged the development of cultural-based solutions to achieve more effective reductions in greenhouse gas emissions, as well as to achieve CCA, with a focus on vulnerable communities and ecosystems. It also called for enhanced understanding and action with respect to loss and damage, as well as for solidarity with those most impacted by, or least able to bear the cost of, climate change to enable them to safeguard their heritage in the face of a changing climate.

Following this *Resolution*, the ICOMOS Climate Change and Heritage Working Group were also created to address CH and climate change, and support work on climate change by ICOMOS national committees across the world, as well as by the ICOMOS network of international scientific committees and other working groups. In July 2019, the ICOMOS Climate Change and Heritage Working Group issued a report [25] showing that CH offers immense and virtually untapped potential to drive climate action and support ethical and equitable transitions by communities towards low carbon, climate resilient development pathways. Nevertheless, the report also highlights that better recognition of the cultural dimensions of climate change and adjusting the aims and methodologies of heritage practice are needed to realize that potential. Aside from this report, the ICOMOS Climate Change and Heritage Working Group also proposed a draft recently for a new ICOMOS *Charter on Climate Change and Heritage* that is expected to be accepted in the 20th ICOMOS General Assembly that will be held in Sydney, Australia, in 2020.

In addition to these documents and initiatives related to climate change and CH, reference is also made to the recently developed framework to assess the vulnerability of CH to climate change using a *Climate Vulnerability Index* (CVI) [26]. The CVI was specifically developed by the James Cook University, Australia, partnering with ICOMOS (among other institutions), to be applicable to different types of World Heritage properties and provides the ability to assess vulnerability according to two components: the Outstanding Universal Value Vulnerability and the Community Vulnerability. The first

component addresses the exposure, sensitivity and adaptive capacity of the critical values that collectively comprise the Outstanding Universal Value, assessing how they will be impacted by three key climate drivers chosen to be the most relevant for a given property. The second component is based on the economic, social and cultural activities that depend on the property, and analyses their adaptive capacity to cope with climate change.

ICCROM

ICCROM has published two documents addressing the topics of CH risk assessment and management. The first is the 2016 manual *ABC Method – A risk management approach to the preservation of cultural heritage* [27] co-published by the Canadian Conservation Institute and ICCROM. This manual offers a comprehensive understanding of risk management applied to the protection of CH, whether collections, buildings or sites. The manual provides a step-by-step procedure and a variety of tools to guide the users (CH professionals) in applying the *ABC method* to their own context. The *ABC method* can be applied to a range of situations, from the analysis of a single risk to a comprehensive risk assessment of the entire heritage asset. The approach proposed by the manual is based on a five-step risk management cycle (establish the context, identify risks, analyse risks, evaluate risks, treat risks) and, for each step, three or more tasks are identified.

The second document is the 2016 *Guide to Risk Management of Cultural Heritage* [28]. This guide is an abridged version of the manual presenting the *ABC method*. It explains the *ABC method* using several images, basic examples and simple exercises. This document was designed to introduce the risk-based approach to decision-makers and to promote its use by heritage professionals and a younger generation of conservators. The document provides guidance to establish a comprehensive view of all risks that may threat a given heritage asset, to identify priorities among different risks or to choose cost-effective options to address them. It also provides guidance for building reliable documentation on the heritage asset under analysis and its risks for future review and monitoring, for analysing the values of CH and how they will be affected by the threats, and for communicating risks and their impacts with decision-makers effectively.

Even though both these documents provide a risk assessment method which is expected to be applicable to different types of CH (i.e. collections, buildings or sites), its applicability for built assets and for certain hazards must be considered with some care. In particular it must be kept in mind that the basis of the proposed methodology is the ABC risk assessment method originally developed for museum collections [19].

Other International documents

An essential reference to community based approach is also made to the 2012 *Venice Declaration on Building Resilience at the Local Level Towards Protected Cultural Heritage and Climate Change Adaptation Strategies* [29] that refers the need to develop adequate

risk management strategies for CH. This Declaration was drafted by local government representatives, national government officials, representatives of the Council of Europe, the European Commission, the private sector, UNESCO, United Nations-Habitat and UNDRR that took part in the event "Building Cities Resilience to Disasters: Protecting Cultural Heritage and Adapting to Climate Change" organized by the City of Venice and UNDRR. Among other aspects, the main recommendations of the *Venice Declaration* highlight the importance of sharing adequate DRR practices with those involved in CH management and conservation, encouraging, in particular, exchanges between cities facing challenges related to the protection of CH in a changing climate. The *Venice Declaration* also highlights the need to promote the engagement of European local-level city networks in embracing resilience to disasters, with a focus on CH protection and CCA, by adhering to the objectives of the Making Cities Resilient Campaign. Furthermore, the document emphasizes the importance of supporting the integration of CH concerns into national and local DRR policies and plans and, at the same time, of ensuring that disaster risks are taken into consideration by management plans and systems for CH.

Additionally, given its relation to the topic of risk assessment, reference is also made to the 2010 version of the standard *ISO 13822 Bases for design of structures - Assessment of existing structures* [30] that provides general requirements and procedures for the safety assessment of existing structures based on the principles of structural reliability and consequences of failure. Aside from general procedures applicable to any type of structure, the standard also presents an Informative Annex dedicated to heritage structures. The contents of this annex, that address specific aspects relevant for the assessment and the analysis of heritage structures, are largely based on the 2003 *Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage* [21] of ICOMOS, whose contents related to structural restoration are discussed in Section 2.3.3 given their relevance for issues concerning post-disaster reconstruction.

5.4.2 Addressing emergency preparedness and response

ICCROM

In 2018, ICCROM published the *Handbook and Toolkit First Aid to Cultural Heritage in Times of Crisis* [31]. This handbook was a two-part publication created for the various actors involved in an emergency involving immovable CH. The publication provides a practical method and a set of ready-to-use tools for securing endangered CH. The user-friendly workflows that are provided help readers to plan and implement coordinated cultural rescue and safeguard operations that involve local communities, heritage custodians, emergency responders and humanitarians. This publication is particularly useful for the capacity building of local communities in case they are the first to try to safeguard their CH in an emergency scenario. Simultaneously, this publication also targets first responders that may not be aware of what is culturally important and lack the training to handle heritage objects and structures.

Although not dealing strictly with immovable CH, ICCROM also co-produced with UNESCO the handbook *Endangered Heritage: Emergency Evacuation of Heritage Collections* [32] that provides guidelines on how to evacuate heritage objects and collections in emergency scenarios. This handbook helps institutions to prepare for potential disasters, but also provides guidance on the evacuation and temporary storage of collections and movable artefacts during an ongoing crisis. The handbook presents a simple workflow with a step-by-step guide on how to evacuate valuable objects in the face of an imminent threat, from the emergency documentation to the safe transport to temporary storage, that can be easily adapted to different contexts.

ICOMOS

In 2017, ICOMOS published the *Guidance on Post Trauma Recovery and Reconstruction for World Heritage Cultural Properties* [22] addressing actions and procedures that must be carried out following a disaster that affected CH assets. Among other aspects, the document emphasizes that, following a disaster, an initial assessment of the impacts to the values of CH properties must be performed as soon as possible. The document acknowledges that this assessment may be provisional since, in the immediate aftermath, the primary focus of in-situ operations is likely to target infrastructural, security and humanitarian response. The *Guidance* also refers that documenting these impacts should involve multiple means such as image capture and other forms of data recording, as well as approaches based on more recent technologies such as crowdsourcing, drones and robots for 3D documentation, among others. Additionally, the *Guidance* also highlights that adequate measures should be in place to collect these data that will provide future evidence to assess the impacts on cultural values and attributes, and to identify further actions towards recovery or reconstruction. The *Guidance* also mentions that adequate international- and national-level coordination must also be in place to ensure these data are managed and transmitted in usable forms. On this issue, the *Guidance* emphasizes the important role of these data not only for the recovery actions and the loss assessment following the disaster, but also as a resource to develop an enhanced response to other similar events.

Aside from collecting disaster impacts on CH, the *Guidance* also refers that, while initial post-disaster responses are ongoing, adequate means must be put in place to safeguard, stabilise and secure impacted heritage structures, to avoid further damage and loss. In particular it refers that in-situ protection should be used when possible, but controlled dismantling may sometimes be necessary to protect life or to enable later repairs and reconstruction of the existing fabric. This latter option, however, should only be considered when temporary shoring is insufficient. The *Guidance* also emphasizes that these protection measures must be extended to safeguard fragments, contents and artefacts. In this case, these elements must be identified, protected, collected, numbered, and if displaced, securely stored for later reuse and to prevent looting. Finally, the *Guidance* also mentions that modern technologies can be important for developing

temporary shoring, protection and storage solutions, but such interventions must involve adequate engineering expertise in cases where structures have become unstable.

ICBS

In 1998, the ICBS (International Committee of the Blue Shield), UNESCO and delegates from CH organizations of Belgium, Bosnia and Herzegovina, Croatia, France, Hungary, Italy, Netherlands, Poland, Slovenia and Sweden produced the 1998 *Radenci Declaration on the Protection of Cultural Heritage in Emergencies and Exceptional Situations* [33]. This document was developed as a response to the significant loss of CH due to armed conflicts and natural disasters that had been witnessed recently, and established a series of principles addressing the protection of CH in the immediate aftermath of disasters or in armed conflicts. In particular, these principles highlighted that institutions and authorities managing CH should integrate risk preparedness and management within their operations to avoid loss or damage in disasters, namely by improving prevention, preparedness, response and recovery measures. The *Radenci Declaration* also lists a series of strategic recommendations to achieve a more efficient cultural protection. In particular, the *Radenci Declaration* highlights the importance of developing stakeholder networks, the need to establish emergency plans, and the need to have trained personnel involved in CH protection. This *Declaration* then also proposes a series of means that can be implemented to achieve the referred strategic recommendations, where issues related with the availability of adequate funding and resources, and of adequate training and capacity building materials are given emphasis.

In 2004, following the first international meeting of the ICBS held in Torino, Italy, representatives of the ICBS and of several National Blue Shield Committees re-emphasized the principles of the *Radenci Declaration* through the *Torino Declaration* [34] which contained the resolutions of this meeting. The *Torino Declaration* draws from previous general declarations and conventions such as the 2001 Universal Declaration on Cultural Diversity adopted by UNESCO [35], the 1954 Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict, including the 1954 First and the 1999 Second Protocols [36]). The *Torino Declaration* proposes a series of recommendations for protecting CH in case of disasters caused by man-made or natural hazards that may affect both movable and immovable CH. Among other aspects, the *Declaration* emphasizes the importance of risk preparedness, response and recovery for CH protection, and recommends that CH professionals integrate these stages into their programmes and activities. Furthermore, the *Torino Declaration* also recommends that ICA (International Council on Archives), ICOM (International Council of Museums), ICOMOS and IFLA (International Federation of Library Associations and Institutions) national members:

1) Create a National Committee of the Blue Shield, in countries where it does not exist;
2) Lobby for national authorities to support these committees so they can operate to protect movable and immovable CH in case of disasters.

Finally, the *Torino Declaration* also states, for the first time, the decision to establish and strengthen ICBS as a visible and effective entity.

In 2011, ICBS issued the *Seoul Declaration on the Protection of Cultural Heritage in Emergency Situations* [37] following the International Conference of ICBS held in Seoul, Republic of Korea. The *Seoul Declaration* partially reaffirms previous ICBS declarations and assessments (the *Radenci Declaration*), highlighting the importance of protecting CH in emergency situations. Among the key points referred by the *Seoul Declaration*, reference is made to the importance of mobilising intellectual, technical, logistical and financial resources, before, during and after a disaster, between different professional bodies and stakeholders involved in CH recovery. In this context, the *Seoul Declaration* also states that ICBS will explore:

- The feasibility of establishing a fund for immediate relief efforts in emergency situations involving CH.
- The procedures needed to adequately plan and prepare the response to emergency situations involving CH.
- The feasibility of developing partnerships with cultural and relief organisations to improve the operational response in emergency situations involving CH.

Finally, the *Seoul Declaration* refers that, given the mandates of the institutions that form ICBS, this organisation should be the focal point for coordinated international rescue and relief whenever disasters endanger CH.

5.4.3 Addressing post-disaster reconstruction

The documents presented in the subsequent paragraphs show how issues related to post-disaster reconstruction of CH are intrinsically connected to the wide-range discussion on CH authenticity. Also, it is currently accepted that CH preservation should account for more than just the preservation of historical fabric [38], thus widening the scope of factors that need to be accounted for when addressing post-disaster reconstruction of CH. Still, the complexity of this debate is deeply rooted in cultural differences. Therefore, decisions or views on the acceptability of post-disaster reconstruction of CH are likely to be made depending on the situation and on the specifics of the multiple societal factors that it involves. As such, the documents that are briefly presented in the following, which are found to be relevant for this discussion and are not solely focussed on post-disaster reconstruction, are not expected to readily provide all the answers to any particular scenario involving the possible post-disaster reconstruction of CH. Instead, they provide a reference that should guide the discussion and the decisions to be made.

World Bank documents

In the context of post-disaster reconstruction, a specific reference should be made to the "*build back better*" concept. Although this concept was not developed having in mind

issues related with CH post-disaster reconstruction and recovery, its widespread use and adoption among DRM practitioners, policy makers and researchers means that it is also being integrated into the CH protection lingo. Still, the adaptation of this concept for CH should be done with some caution, especially for cases involving physical reconstruction.

According to the 2016 United Nations *Report of the Open-Ended Intergovernmental Expert Working Group on Indicators and Terminology Relating to Disaster Risk Reduction* [39], "*build back better*" is defined as the use of the recovery, rehabilitation and reconstruction phases after a disaster to increase the resilience of countries and communities by integrating DRR measures into the restoration of physical infrastructure and societal systems, and into the revitalization of livelihoods, economies and the environment. In the overall, "*build back better*" is expected to comprise efforts to prevent re-creating or intensifying pre-disaster vulnerabilities in the process of reconstruction and recovery. Although the scope of the "*build back better*" concept is far wider than just the issues related to the reconstruction of the built environment and of the economy, these two aspects are seen too often overshadow the implementation of social and psychological recovery of the affected communities. Therefore, despite being an engaging and attractive slogan, evidence shows that the multiple dimensions that are implicit in the "*build back better*" concept are not being adequately addressed in many cases (e.g. see [40] and references therein).

Implementations of the "*build back better*" concept explicitly connected to the CH sector are still scarce. In this context, reference is made to the framework proposed by UNESCO and United Nations-Habitat for the reconstruction of Mosul [41] where the "*build back better*" concept is expected to be implemented for developing a people-centred vision for the future of the city. On the contrary, in another example involving the CH and community recovery in Aceh, Indonesia, after the 2004 tsunami, Daly and Rahmayati [42] describe that the implementation of the "*build back better*" concept failed to account for Acehnese cultural and social practices, thus undermining important mechanisms to ensure an internally-driven social rehabilitation of the area. More recently, based on the conviction that culture is critical to achieve sustainable urban development and ensure effective post-disaster reconstruction and recovery, UNESCO and the World Bank published a position paper entitled *Culture in City Reconstruction and Recovery* [43] proposing a framework that mainstreams culture into post-disaster city reconstruction and recovery, integrating people-centred and place-based policies. In particular, the position paper refers that the proposed framework is expected to overcome the issues with existing reconstruction and recovery approaches, such as those based on the "b*uild back better*" concept whose emphasis is said to be mostly on the quality of the built environment and its resilience to future disasters. As such, the proposed framework highlights that the culture of communities, which includes their tangible and intangible CH as well as their cultural and creative industries, plays a vital role in post-disaster recovery and reconstruction. Still, most of the framework appears to be built around aspects connected to intangible features of CH and communities, and little is said with

respect to issues that should be accounted for when envisaging the physical reconstruction of CH.

UNESCO

Even though the debate on CH reconstruction has been ongoing for several decades, the shortcomings of CH policies in providing guidance for a practical and inclusive reconstruction process in a post-disaster scenario was only clearly established in Decision 40 COM 7.12 of the World Heritage Committee in 2016 [44]. This is also highlighted in the Shelter *D6.1 Glocal user requirements* in which the policies outlying the land insurance for land owners were not designed with them in mind and as a result 96% of them did not use it. Aside from other documents that were produced (see next paragraph), the 2018 *Warsaw Recommendation on Recovery and Reconstruction of Cultural Heritage* [45] was developed as a response to such shortcomings and reflects several antecedent documents, namely the 1994 *Nara Document on Authenticity* [21]. The *Warsaw Recommendation* reaffirms the connection between reconstruction and authenticity as discussed in paragraphs 79 to 86 of the *Operational Guidelines for the Implementation of the World Heritage Convention* [46]. In particular, paragraph 86 states that reconstruction of archaeological remains or historic buildings or districts is justifiable only in exceptional circumstances, and that reconstruction is acceptable only on the basis of complete and detailed documentation and to no extent on conjecture. Still, the *Warsaw Recommendation* also recognizes the legitimate aspiration of concerned communities to overcome the trauma of disasters by reconstructing, as soon as possible, their cities and villages, and particularly their affected CH, as a means to reaffirm their identity, restore their dignity and lay the conditions for a sustainable social and economic recovery. In practice, the *Warsaw Recommendation* establishes a set of non-exhaustive principles and specific recommendations in order for the World Heritage Committee to continue the reflection on the complex multidisciplinary process that is reconstruction within World Heritage properties. Moreover, this further reflection is then expected to evolve towards developing new guidance that is able to reflect the multi-faceted challenges that CH reconstruction involves. In particular, the *Warsaw Recommendation* highlights:

- The importance of understanding the values of a heritage site and the attributes that carry these values prior to taking any decision on a proposal for reconstruction and recovery. Simultaneously, values identified by local communities and new values resulting from the traumatic events associated with the destruction should also be integrated in this process.
- The need to follow people-centred approaches and fully engage communities and relevant stakeholders in reconstruction and recovery processes.
- The importance of proper documentation and inventories.

- The need for establishing a strong governance based on a fully participatory process that includes mechanisms that coordinate national and international actors.
- The adoption of the historic urban landscape approach [47], to set out a holistic planning strategy for reconstruction and recovery that integrates CH within the larger framework of urban development.
- The role of education and awareness-raising to promote the knowledge, appreciation and respect for the diversity of cultures.

Alongside these principles, it establishes that, in post-disaster situations, the overall goal is the recovery of the society. Among other aspects, this involves restoring or improving the economic, physical, social, cultural and environmental assets, systems and activities of an affected community or society, aligning with the principles of sustainable development and "*build back better*". An essential part of this process is the recovery of CH, which may include reconstruction. According to the *Warsaw Recommendation*, in the World Heritage context, the term "reconstruction" is understood as a technical process for the restitution of destroyed or severely damaged physical assets and infrastructures following a disaster. Furthermore, it emphasizes that, in this context, the reconstruction of physical assets must give due consideration to their associated intangible practices, beliefs and traditional knowledge which are essential for sustaining cultural values among local communities.

ICOMOS

Since the publication of the *Venice Charter for the Conservation and Restoration of Monuments and Sites* in 1964 [21] and until the publication of the 1994 *Nara Document on Authenticity* [21], the reconstruction of CH sites has not been an accepted practice. Until then, reconstruction was a falsification of the artistic or historic evidence and works that needed to be performed for CH preservation were required to be distinct from the original architectural composition and to make their contemporary nature very clear. To provide a wider understanding of cultural diversity, CH and their relationship with conservation and preservation, the 1994 *Nara Document on Authenticity* [21] produced a broader framework to analyse authenticity and assist practical decision-making in CH conservation. In particular, the document highlights that, when authenticity issues are being assessed for a CH asset, the underlying cultural context should also be considered.

After the *Nara Document*, post-disaster reconstruction of CH has also been addressed in the 2000 *Riga Charter on Authenticity and Historical Reconstruction in Relationship to Cultural Heritage* [48]. This document revisits the debate on reconstruction and defines it as an evocation, interpretation, restoration or replication of a previous form. This document was drafted following concerns related to reconstruction and authenticity issues in several former Soviet countries that had recently regained independence. From a doctrinal point of view, this document became a warning regarding the use of re-invented monuments as symbolic narratives to build national identity and redefine

national history. In the *Riga Charter*, authenticity and reconstruction are particularly connected when referring that "replication of CH is in general a misrepresentation of evidence of the past, and that each architectural work should reflect the time of its own creation, in the belief that sympathetic new buildings can maintain the environmental context". According to [49], this statement can be interpreted to mean that a reconstruction is not "sympathetic" or compatible architecture.

Over the following years, a discussion around the topic of reconstruction continued within ICOMOS. Among other activities, an international colloquium and different workshops took place around this topic, some of which were specifically organised in response to the explicit request for guidance in Decision 40 COM 7.12 of the World Heritage Committee in 2016 [44, 50-53]. As a result of these initiatives, the 2017 *Guidance on Post Trauma Recovery and Reconstruction for World Heritage Cultural Properties* [22] was recently published. This working document is focussed on CH concerns, more specifically on World Heritage, but also acknowledges the wider social, environmental and economic factors that post-disaster recovery must address. The *Guidance* was developed to help relevant stakeholders addressing the specific issues involved in CH destruction, in particular when assessing damage to the explicit or implicit attributes supporting its values, while accounting also for the importance of intangible heritage in the safeguard of those values. Although World Heritage properties are the primary focus of this document, it also notes that destruction may also affect their surrounding immediate and wider settings that support the attributes of their values. Such destruction also applies to the social, environmental and economic structures that underpin the persistence of cultures. Regarding the specific aspects related to post-disaster reconstruction, the *Guidance* recognises that, in some cases, recovery actions and reconstruction may exacerbate the destructive effects of disasters in terms of loss of values, while in others, it may contribute to the creation of new values. This implies that for defining the recovery and reconstruction options it must be establish the post-disaster status of all the tangible and intangible attributes of value. In this context, the *Guidance* stresses that optimal documentation and evaluation of the surviving attributes and an adequate overall assessment of the disaster impacts are fundamental to achieve a robust identification of the recovery options and should be the basis of any recovery-directed actions. Upon having this information, the question of whether and how reconstruction may allow the recovery of those attributes will arise, as referred by the *Guidance*. To aid in this decision, it provides a series of illustrative examples in which the option of reconstructing the material fabric might be explored.

Aside from the *Guidance,* reference is also made to the 2013 revised version of the Australia ICOMOS *Charter for the Conservation of Places of Cultural Significance* (the Burra Charter) [21] which also touches on the issue of CH reconstruction. In this document, reconstruction is only appropriate where a place is incomplete through damage or alteration, and only where there is sufficient evidence to reproduce an earlier state of the fabric. In some cases, reconstruction may also be appropriate as part of a

use or practice that retains the cultural significance of the place. For examples, places with social or spiritual value may warrant reconstruction, even though very little may remain – such as building footings only or tree stumps following a fire, a flood or a storm. In this case, the requirement for sufficient evidence to reproduce an earlier state still applies. Nevertheless, reconstructed elements should be identifiable on close inspection or through additional interpretation.

In connection to this topic, a brief reference is also made to the 2003 *Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage* [21]. Even though these *Principles* do not deal with post-disaster reconstruction of CH, they provide a set of guidelines for the analysis and restoration of historical structures that are also relevant in a post-disaster context. Part of the contents of these *Principles* address issues that are in line with the post-disaster approach proposed by the *Guidance*. For example, these *Principles* also highlight that any intervention in a CH construction must be based on a thorough knowledge of its history and structural problems (that should be interpreted as disaster impacts in a post-disaster context). In particular, the intervention process proposed by the *Principles* must follow three different phases: diagnosis, safety evaluation and design of the intervention. For each phase, the *Principles* provide concepts and methodological guidance to assist the analyst in obtaining scientifically derived conclusions about the true condition of the CH construction, its structural safety and the need for repair or strengthening. In doing so, the *Principles* emphasize that these interventions require a multidisciplinary approach, and touch upon authenticity-related issues by referring they cannot be based on fixed criteria since the respect for all cultures also means that their physical heritage needs to be considered within the cultural context to which it belongs. Even though, as referred before, these *Principles* do not deal with post-disaster recovery, the methodological approach they propose should also be considered in such scenarios. However, when porting these *Principles* to deal with CH reconstruction, it must be noted that they also emphasize that the value of architectural heritage is not only in its appearance, but also in the integrity of all its components as a unique product of the specific building technology of its time.

5.5 Results at EU level

A total of 118 relevant references were collected and analysed, 23 of which are documents produced at the European level. Most of the documents analysed are issued by the European Commission and the Council of Europe. In addition to these documents, a few studies relevant to the topic of DRM in CH were also analysed for completeness. Given the lack of policies addressing specifically issues related to immovable CH and DRR, emergency preparedness and response, or post-disaster reconstruction, a few general policies and instruments were also analysed given their applicability and relevance to the CH sector.

5.5.1 Addressing disaster risk management, risk reduction and prevention

European Union

In 2007, the European Parliament commissioned a study to examine the state of national and international instruments and activities addressing the protection of CH from natural disasters at the time [54]. The study described examples of best practices and discussed problems and shortcomings of current European approaches to this issue. At the time, CH protection was seen to be a marginal concern in most European Union (EU) countries, often overshadowed by environmental issues which attracted greater political attention due to their close relation to health and nature conservation. As a result, the study highlighted a series of priorities for action after analysing the current EU legislation and defined, among others, the following policy and high-level strategic needs:

- European policy, legislative and institutional frameworks for protecting CH from disaster risks and impacts.
- European strategies and operational procedures that integrate the protection of CH, to ensure timely and effective rescue of people in emergency situations.
- Capacity-building plans and programmes to meet the requirements for cost-effective protection of CH from natural hazards.
- Resources for the development and implementation of measures to protect CH from natural disasters.
- Mobilisation of Member States to demonstrate strong political determination and willingness to integrate CH protection measures into national policies and programmes.
- Identification and mapping of CH assets at risk from natural hazards, followed by the development of periodically updated vulnerability maps for decision makers, the general public and communities at risk.
- Development of monitoring systems for recording changes in CH assets at risk.
- Development of databases on disaster impacts and losses in CH.
- Development of standards for assessing the safety of CH subjected to excessive loads during exceptional situations.
- Development of structural measures and practical guides to protect CH from natural disasters, including timely maintenance and strengthening interventions.

As can be seen, the study highlighted the main building blocks of a consistent approach towards reducing disaster risks in CH in Europe. Still, little progress has occurred since then on most of these issues and only a few EU policy documents refer to matters related to CH protection. Among those, the Lisbon Treaty [55], an international agreement on the constitutional basis of the EU, refers the need for the EU to ensure the safeguarding of CH of European significance. Aside from this document, CH is also mentioned in the EU Flood Directive [56] which is a framework document dealing with flood prevention and management. This document states that EU Member States should carry out flood risk assessments accounting for historic floods, establish mechanisms to assess flood

hazard and flood risk defined as the impact of significant flooding on health, the economy, the environment and CH.

More recently, the EU adopted the *Work Plan for Culture 2015-2018* [57] where the Council of the EU and representatives of the governments of the Member States agreed to address and pursue a series of priorities and actions connected to four main areas: accessible and inclusive culture; CH; cultural and creative sectors; promotion of cultural diversity, culture in EU external relations and mobility. In the actions prioritising *CH*, DRR issues are only mentioned once referring that a study would be developed by the European Commission to address the topics of risk assessment and prevention for safeguarding CH from the effects of natural disasters and threats caused by human action, as well as the mapping of existing strategies and practices at the national level. The outcomes of this study were recently published in the report *Safeguarding Cultural Heritage from Natural and Man-Made Disasters - A comparative analysis of risk management in the EU* [58], which, among other issues, recalls the main shortcomings of the 2007 study previously referred. However, the more recently adopted *Work Plan for Culture 2019-2022* [59] does not follow-up on the issues that were identified in this report. The priorities and actions of the *Work Plan for Culture 2019-2022* are connected to the following five main areas: sustainability in CH; cohesion and well-being; an ecosystem supporting artists, cultural and creative professionals and European content; gender equality; international cultural relations. In the actions related to the priority *sustainability in cultural heritage*, one is related to adaptation to climate change and refers to the importance of focusing on the safety of heritage under extreme climate circumstances.

As a complement to this *Work Plan*, and to build on the momentum generated by the activities and outcomes of the European Year of Cultural Heritage in 2018, the European Commission presented the *European Framework for Action on Cultural Heritage* [60] at the end of 2018. This *Framework* promotes and puts into practice an integrated and participatory approach to CH and contributes to the mainstreaming of CH across EU policies. Among other aspects, the *Framework* entails several aspects aimed at measuring the impact of actions on CH by improving the methodology and tools to collect data for cultural statistics. The actions should be applied in cooperation with the statistical offices of EU Member States, the UNESCO Institute for Statistics and networks like the European Group on Museum Statistics. This *Framework* is based on five pillars. Pillar 3 is defined as *Cultural heritage for a resilient Europe: safeguarding endangered heritage* that addresses, among other issues, the protection of CH against natural disasters and climate change. The *Framework* also sets further a tentative list of actions to be pursued in order to implement the objectives of each pillar. In the case of Pillar 3, these include, among other actions, supporting research and capacity building projects to improve the understanding of disaster risks to CH, through the collection of disaster loss data, to further investigate the impact of natural disasters on CH and to strengthen preventive measures. As part of these actions, reference is made to a review that will be

carried out by the European Commission. Through ongoing and past Horizon 2020 research and innovation projects addressing the resilience of CH and its protection from multiple risks, project results will lead to a report with recommendations for policies.

Aside from these documents, an additional reference is made to the 2016 *Action Plan on the Sendai Framework for Disaster Risk Reduction 2015-2030* [61] which builds on the SFDRR to further enhance and promote disaster risk management and its integration in EU policies. The *Action Plan* translates the SFDRR priorities across existing EU policies and identifies some actions that can also complement existing initiatives of EU Member States to implement the SFDRR. Concerning CH, the *Action Plan* highlights the need to integrate CH in national DRR strategies developed by EU Member States. Additionally, it also emphasizes the need to ensure the exchange of information among Member States on existing strategies and practices for risk assessment and prevention for safeguarding CH from natural and man-made disasters, within the framework of the European Agenda for Culture.

Although not strictly related to the CH sector, reference is also made to the Union Civil Protection Mechanism (UCPM) that requires EU Member States to fulfil certain obligations on the topic of risk assessment. The legal foundations of the cooperation in civil protection in Europe were established in 2001 [62], recast in 2007 [63], further revised in 2013 [64] and amended in 2019 to establish the current UCPM [65]. The UCPM aims to strengthen cooperation in the field of civil protection, with an emphasis on disaster prevention, preparedness, and response. To this end, the UCPM pools response capacities and capabilities from the EU Member States and six other participating states (Iceland, Norway, Serbia, Turkey, Republic of North Macedonia and Montenegro), all of which commit national resources for emergency responses. The general objective and scope of the UCPM is described in [65]. In the context of protection, it will cover primarily people, but also the environment and property, including CH, against all kinds of natural and man-made disasters, including the consequences of acts of terrorism, technological, radiological or environmental disasters, marine pollution, and acute health emergencies. Regarding situations involving acts of terrorism or radiological disasters, the UCPM might only cover preparedness and response actions. Among other aspects of the UCPM, it refers that Member States are required to regularly share with the European Commission information about their risk assessments and about their risk management capability, focusing on key risks. Although not explicitly stated in the UCPM, this implies that such national risk assessments should be performed for all sectors, or at least those covered by the scope of the UCPM, which includes CH.

Given its relevance to the scope of this section, reference is also made to the Copernicus programme, which is the EU Earth observation programme coordinated and managed by the European Commission in partnership with the European Space Agency, the EU Member States and other EU Agencies [66]. The Copernicus programme is one of the European flagship programmes, providing free and open data relying on satellite-based

imagery, models and in-situ data. The Copernicus programme is a public service designed to respond to policy and public administration needs, whose services can also be used to foster economic growth in Europe. Considering that CH is not mentioned in the original agreements of the entities in charge of the Copernicus core services, no product has currently been developed specifically for the CH sector, namely for aspects related to risk assessment and management, or disaster preparedness and emergency. Nevertheless, the Copernicus core services already have access to the several remote data sources, models and in-situ data sources that can respond to certain user requirements of the CH sector. In order to fully understand what are the user requirements of this sector and to support the European Commission in analysing the possibility of starting an institutional action for promoting the use of Copernicus data for CH preservation, monitoring and management, a study [67] was recently performed to analyse these issues.

Among other aspects, through surveys and literature reviews, the study has identified 373 user requirements expressed by CH user communities, where many of them can be directly related to needs for risk assessment and management, as well as for disaster preparedness and emergency. Those user requirements were then translated into technical specifications to analyse if they can be matched with current Copernicus capabilities. Technical specifications refer to the translation of user requirements into existing Earth Observation technical solutions that include sensors, wavelength and spatial resolution specifications. This analysis revealed that 7.5% of the CH user requirements are already fully covered by Copernicus core services products in their current form, and an additional 19.0% of user requirements are partially covered by existing Copernicus core services products without adaptation. With the support of Sentinels and Contributing Missions capabilities, 50% of the user requirements could be fully covered, while an additional 14% could be partially covered. The partially covered user requirements could potentially be supported by services provided by the downstream industry that has access to very high-resolution data and/or very high revisiting time imagery not available in the pool of Copernicus Contributing Missions. By using all Copernicus capabilities (core services products, Sentinels and Contributing missions), 64.1% of CH user requirements could be covered. Nevertheless, 35.9% of CH user requirements will not be covered by the Copernicus programme (core services products, Sentinels and Contributing missions). Of these, 7% cannot be covered because the spatial or temporal resolution needed is not available within Copernicus. Moreover, 12.9% of those requirements cannot be covered because they require specific sensors and/or wavelengths that are not available in the scope of the Copernicus programme (e.g. hyperspectral, lidar). However, such sensors and wavelengths exist on the commercial market, especially by using airborne sensors (e.g. using UAVs). Finally, 16.1% of those requirements cannot be covered by satellite-based imagery at all, as they require very specific in-situ measurements (e.g. Ground Penetrating Radar, in-situ bathymetric surveys, etc.).

Council of Europe

Since the 1950s, several Conventions, Declarations, Recommendations and Resolutions have been referring the need to promote and enhance CH protection [68]. To name just a few, reference is made to some of the more recent conventions such as the *European Landscape convention* (ETS No. 176, Florence 2000) [68], the *Framework Convention on the value of Cultural Heritage for Society* (ETS No. 199, Faro, 2005) [68], or the *Council of Europe Convention on Offences relating to Cultural Property* (ETS no. 221, Nicosia, 2017) [68]. However, explicit reference to the need to perform risk assessments or to establish adequate risk management strategies, namely by developing partnerships between UNESCO, the EU and ICCROM, is only found in a few documents. One of these documents is the *Namur Declaration* adopted at the 6th ministerial conference of Ministers responsible for Cultural Heritage in 2015 [68]. Aside from these, reference is also made to the 1993 *Recommendation No. R (93) 9 on the protection of the architectural heritage against natural disasters* [65] which provides detailed guidance on several aspects, namely on developing risk assessments for multiple hazards, disaster prevention plans or risk awareness training.

With respect to the importance of climate change impacts, a brief reference is made to the *Recommendation of the Committee of Ministers to member States on the European Cultural Heritage Strategy for the 21st century* [69]. This *Recommendation* calls for more reliable and quantitative data on the impacts of climate change on CH, given their influence in the rate of degradation and the loss in value of CH. Therefore, these direct impacts may then lead to other impacts in other sectors, such as cultural tourism, local or regional economies, but also in the planning that needs to be foreseen for maintenance and conservation resources.

Within the European and Mediterranean Major Hazards Agreement [70] (*EUR-OPA Agreement*), a note is also made regarding some Recommendations it has issued that deal with CH. The *EUR-OPA Agreement* was established by the Committee of Ministers of the Council of Europe in 1987 as a platform for cooperation in the field of major natural and technological disasters between Europe and the South of the Mediterranean. In particular it covers DRM topics such as prevention, preparedness, risk management and post-crisis analysis. The main objectives of the *EUR-OPA Agreement* are to reinforce and to promote cooperation between Member States in a multidisciplinary context, to ensure better prevention, protection against risks and better preparation in the event of major natural or technological disasters. Over the years, the *EUR-OPA Agreement* and its Committee have produced several Resolutions and Recommendation on a variety of issues related to DRM. Among those, reference is made to the 2009 *Recommendation on vulnerability of cultural heritage to climate change* [71] and to the 2018 *Recommendation CM/Rec (2018)3 on cultural heritage facing climate change: increasing resilience and promoting adaptation* [71]. Both address issues related to climate change

but, while the former establishes a series of actions that Member States should implement such as, among others:

- Assess the risk to CH from climate change.
- Identify cultural assets at higher risk and evaluate necessary preventive and adaptation measures.
- Promote the adoption of emergency planning for sites most vulnerable to events such as floods, landslides, coastal erosion and extreme weather-related events.
- Promote at inter-agency cooperation on climate change and CH, integrating heritage concerns into DRR policies.

The latter simply reiterates these concerns by integrating the former *Recommendation* as an annex and by recommending Member States to implement the following actions:

- Ensure the inclusion of CH in their policies and strategies for adaptation to climate change.
- Assess the economic value of CH lost to climate change.

Other documents

The Confederation of Fire Protection Associations Europe (CFPA-Europe) is an association of national organisations in Europe concerned primarily with fire prevention and protection. Among other activities, it has produced guidelines to achieve a common interpretation of these issues in European countries and to give examples of acceptable solutions, concepts and models. One of the guidelines that were published is 2013 Managing fire safety in historical buildings [72] that is aimed at owners, managers, caretakers and other responsible for the safety of historical buildings. This guideline provides knowledge about basic, simple, low-cost actions to protect historic buildings from fire, and indicates routes to more advanced ways of protection. Moreover, it briefly addresses the importance of regularly performing risk assessments, actions related to prevention of fire spread, evacuation, salvage of items of historical value, staff training, and aspects to account for to ensure an effective intervention of fire brigades. The proposals within this guideline were produced by the Slovenian Fire Protection Association based on multiple documents and studies, in particular the results of the COST Action C17 - Built Heritage: Fire Loss to Historic Buildings [73].

5.5.2 Addressing emergency preparedness and response

Since there are no European policies and guidelines addressing disaster preparedness and response issues specifically for CH, a brief reference is made to the scope of the UCPM. The UCPM also helps to coordinate disaster preparedness and prevention activities of national authorities and contributes to the exchange of best practices. In this context, the UCPM includes a training programme for civil protection experts from EU Member States and Participating States that ensures the compatibility and complementarity of

intervention teams, while large-scale exercises train capacities for specific disasters each year.

Aside from the UCPM, and although there is currently no training programme that specifically addresses CH, a brief reference is made to an ongoing European project called PROCULTHER [74] which is co-financed by the EU Directorate-General for European Civil Protection and Humanitarian Aid Operations and that is expected to develop the following activities:

- Establish a European methodology for the protection of CH in emergency situations.
- Establish a multi-national civil protection capacity to provide guidance and support for CH first aid during emergencies.

5.5.3 Addressing post-disaster reconstruction

In 2008, the *Joint Declaration on Post-Crisis Assessments and Recovery Planning* [75] was established by the EU, the World Bank and the United Nations Development Group with the purpose of providing support to the mobilization of resources for post-crisis recovery frameworks, by answering recovery needs of vulnerable populations and strengthening the capacity of national institutions for effective prevention, response and recovery. In countries hit by natural hazards, the *Joint Declaration* is operationalised through a *Post Disaster Needs Assessment* (PDNA) [76]. The PDNA methodology provides a framework to determine human recovery needs and to value damages and losses, and combines sector-specific tools developed by the United Nations agencies and the DaLA (Damage and Loss Assessment) methodology developed by ECLAC (Economic Commission for Latin America and the Caribbean). A PDNA is launched by request and led by the government of the affected country, with the support of national and international stakeholders. Its fundamental purpose is estimating disaster damage and losses across all sectors of the economy that are affected, as well as recovery, relief, reconstruction and risk management needs. Additionally, it will provide guidance for developing actionable and sustainable post-disaster short-term and long-term recovery strategies, namely with respect to mobilizing the necessary financial and technical resources. The PDNA methodology has a chapter dedicated to the culture sector that covers damage to both tangible and intangible heritage and where the approach recommended for quantifying economic impacts accounts for the proposals in [77]. Additionally, this chapter also covers losses to repositories of heritage (e.g. museums, libraries, archives, etc.) and to cultural and creative industries (i.e. infrastructure, resources and processes for the production, distribution and sale of creative cultural goods). For the culture sector, the PDNA methodology includes the following steps:

- Define the pre-disaster baseline data about the culture sector (this includes collecting information on the type, number and condition of tangible and intangible

CH assets – including people – in the disaster-affected area, framing their historic and geographical setting).

- Assess the disaster effects on cultural assets (i.e. physical damage levels and death of significant individuals), on service delivery, production and access (e.g. heritage sites with limited or no access, interruption of intangible heritage practices or inability to produce heritage-related goods), on governance and decision making processes (e.g. disruption of key functions in the sector, loss of human resources, equipment or documentation), as well as on risks and vulnerabilities (e.g. increased vulnerability due to inadequate protection after a disaster or exposure to new hazards).
- Economic valuation of the disaster effects by establishing, whenever possible, costs related to the damage (i.e. the physical damage to the cultural assets) and losses (the changes in the flow of goods and services such as loss of revenues and/or additional costs) due to the disaster and that may extend throughout the rehabilitation and reconstruction periods.
- Macro-economic (e.g. on gross domestic product) and human-development (e.g. resilience, social inclusion, well-being, identity, or quality of education) impacts of the disaster, with specific reference to cross-sector considerations, using adequate quantitative or qualitative indicators.
- Statement of recovery needs providing a vision for the full recovery process. It will also propose a recovery plan for the culture sector that includes cost estimates, a monitoring framework and implementation arrangements.

Aside from the PDNA methodology, reference is also made to the *European Union Solidarity Fund* (EUSF) as another European instrument for post-disaster recovery. The EUSF was created in 2002 [78] and amended in June 2014 [79], and translates solidarity into the form of financial aid to EU Member State and candidate countries experiencing "serious repercussions on living conditions, the natural environment or the economy" following a disaster caused by a natural hazard. Currently, the EUSF can be mobilized in cases in which the direct damage exceeds EUR 3 billion (in 2011 prices) or 0.6 % of the country's gross national income, whichever is lower, or if the damage at the regional level exceeds 1.5% of the affected region's gross domestic product. A neighbouring Member State or candidate country that is affected by the same disaster can also receive aid, even if the amount of damage does not reach the threshold. The aid is limited to non-insurable damages and essential emergency and recovery operations. These include infrastructure restoration in the fields of energy, water and wastewater, telecommunications, transport, health and education, temporary accommodation and rescue services, preventive infrastructure and measures of protection for CH, and cleaning up disaster-stricken areas, including natural zones.

5.6 A focus on SHELTER Open Labs

A total of 118 relevant references have been collected and analysed, 56 of which are documents produced at the National level (see Table 4).

A comprehensive desktop analysis on regulatory frameworks, policy, protocols and strategies, produced in the latest years and related to disaster risk management (DRM) on immovable cultural heritage at International and European level has been performed. In the first phase the focus has been on few countries more advanced (i.e. Italy, Spain, Portugal) and countries where documents are available in English (England and Switzerland). In a second phase, after the GLOCAL International workshop organised at UNESCO Venice premises (December 2019), where this preliminary analysis has been shared and discussed with consortium partners and international experts, the focus has been moved to EU countries involved in the SHELTER Open Labs. During this phase, also the documents from the H2020 ARCH sister project have been taken into account, and the references have been analysed from a stricter DRM perspective.

The desktop analysis took into consideration 14 countries in Europe, most of them covering the Shelter project partners and Open Labs. It started with some of the countries with the most developed, accessible online or English written literature and prosecuted, after the SHELTER GLOCAL user requirements workshop, focusing to the other OL countries.

The policies and guidelines from Albania, Croatia, England, Greece, Italy, Portugal, Spain, Switzerland and Turkey were found to be relevant for immovable cultural heritage addressing DRM (DRR, emergency preparedness and response and post-disaster reconstruction).

In addition to these countries, existing policies and guidelines from Bosnia and Herzegovina, Montenegro, Serbia, Slovenia and the Netherlands were also reviewed. Although these countries also have general legal frameworks addressing cultural heritage management and civil protection procedures, specific policies or guidelines connecting them or addressing the previously referred DRM topics were not able to be found.

Furthermore, some countries have general DRM legislation that also mentions CH (among the multiple sectors that are mentioned). Still, those documents are not part of this desktop analysis because not addressing specifically DRM for heritage. In some cases (e.g. Italy, Spain, Portugal), for CH documents that have been codified, included at first and discarded finally because not DRM relevant (see table 4), it was decided to keep them visible, but strikethrough in the list (see Annex 1). In fact, the strikethrough list shows references that have been analysed in the first phase, but in the second phase removed because too general, or not DRM relevant, or not in line with the other task1.2 objectives or because were referring to tools, investigated in Section 6.

Therefore, the next paragraphs will refer only to the 56 national documents reviewed addressing specifically DRM for CH.

Country	Number of relevant documents analysed
ALBANIA	2
BOSNIA AND HERZEGOVINA	0
CROATIA	0
GREECE	5
ITALY	11 (plus six not relevant)
MONTENEGRO	0
NETHERLANDS	0
PORTUGAL	6 (plus three not relevant)
SERBIA	0
SLOVENIA	0
SPAIN	5 (plus one not relevant)
SWITZERLAND	5 (plus one not relevant)
TURKEY	9
UK	13 (plus one not relevant)

Table 4: Number of documents analysed in April 2020 per country

In addition, many national documents are not in English. Therefore, the analysis has been more complicated. In Section 5.7 some considerations on gaps and next steps are presented. As a remark, SHELTER countries documents will be implemented further in the next months thanks to the interaction with stakeholders through OLs.

5.6.1 ALBANIA

Until now, the development of policies and guidelines in Albania addressing CH **DRM** has been scarce. Traditionally, most of Albania's priorities regarding disaster risks have focussed on being prepared to respond to disasters. However, the recent update of the national law addressing the protection of CH, *Law 27/2018* [80], is expected to be a key-step towards a more effective CH preservation policy, particularly given the rising importance of CH in Albania's societal and cultural context. Moreover, the impacts of the recent earthquake of 26th of November 2019 on the CH sector have also contributed to the increasing awareness of authorities regarding the importance of implementing adequate DRM measures for CH. Among other aspects, the new *Law* clearly refers the need to establish measures for the protection of CH against disasters (from natural or

man-made events) and to determine its exposure to risks. In the context of natural events, the new *Law* makes a specific reference to seismic risk, recognizing the importance of addressing this issue. For example, the new *Law* defines restoration as an intervention that should preserve the "original essence of the CH property" and prevent further degradation. However, for CH properties located in earthquake-prone areas, restoration includes structural strengthening actions to improve the seismic safety of the property.

For completeness, a brief reference is made to the DRR initiatives developed by Cultural Heritage without Borders in Albania. This is an independent nongovernmental organisation dedicated to rescuing and preserving CH affected by multiple natural or man-made threats. Regarding its activity in Albania, reference is made to a pilot project carried out in the World Heritage sites of Berat and Gjirokastra involving the use of traditional water cisterns to provide water for firefighting [81]. This pilot project explored the ability to use the houses' traditional large cisterns as a dispersed source of water for firefighters and residents to respond quickly in case of fire. Gjirokastra and Berat's historic zones are vulnerable to fire and past fires have destroyed entire houses and neighbourhoods multiple times in the history of both cities. Since both cities suffer, at times, from a limited supply of water, particularly during hot and dry summer months, and since the cobblestone streets of the historic quarters are often too narrow to be accessed by fire engines, water availability for firefighting is an issue. Furthermore, the proximity of houses is also a relevant factor since it increases the risk of fire spreading rapidly from one building to the next. Considering these issues, a potential solution was found in the historic water cisterns found in many houses, which were used by families before the implementation of the city's central water system. This pilot project involved the installation of a pumping system within the cistern of selected houses that is then connected to a hydrant on the street outside the house. This hydrant can then be used by for firefighting by the fire department.

In terms of **disaster preparedness and response**, further reference is made to the contents of Albania's new law addressing the protection of CH, *Law 27/2018* [80]. In terms of disaster response, the *Law* refers explicitly that, in emergency situations, the Regional Directorates of CH must assess and propose the necessary safety measures for affected CH properties. Still, in exceptional cases, i.e. when measures to ensure the safety or stability of a damaged CH property are urgent, the owner or manager of the property can implement temporary measures to prevent the occurrence of further damage. Nevertheless, the corresponding Regional Directorate of Cultural Heritage needs to be immediately notified of the situation and of the measures that were implemented for further approval. Regarding aspects connected to disaster preparedness, the *Law* seems to only address this issue for the specific case of museums. In particular, it refers that, among other aspects, museums need to develop emergency plans and capacity to ensure the safety of their collections.

In the context of the recent earthquake of November 2019, a brief reference is made to the post-event procedures that were implemented for the CH sector, namely in terms of damage assessment. Between 26th of November and 3rd of December, 203 CH assets and institutional buildings of the Ministry of Culture were surveyed to analyse their damage and safety conditions. The damage data was collected using a short form that was recently developed for CH properties after the earthquake of 21st of September 2019. Aside from the damage survey, security perimeters were also established around the affected CH properties and access was restricted in areas considered to be of higher risk. Furthermore, in certain CH properties, the damage survey was performed with the help of UAVs. Additionally, temporary stabilization measures were also implemented in certain situations, and controlled dismantling was also carried out in structures or elements that could fall during aftershocks. Nevertheless, the stabilization measures that were implemented appear not to have been defined following guidelines or procedures focussing specifically the safeguard of CH.

In Albania no specific procedures or documents were found to address issues related to the **post-disaster reconstruction** of CH. Nevertheless, with the context of Albania's new law addressing the protection of CH, *Law 27/2018* [80], it appears that interventions involving the reconstruction of CH assets are possible if the National Institute of Cultural Heritage and a local governmental body allow it. Still, the conditions under which reconstruction is possible are not established.

5.6.2 ITALY

For the case of **earthquake risk** in CH and historical constructions, Italy has been developing a series of legal guidelines and standards whose latest version is the 2011 *Guidelines for the assessment and mitigation of seismic risk in cultural heritage* [82]. The purpose of these *Guidelines* is to provide a framework for performing structural analysis, assessment and retrofitting tailored to the specific features and needs of heritage structures. The *Guidelines* offer three possible levels of analysis for assessing the seismic performance of a given construction, namely LV1, LV2, and LV3. Each level increases the complexity of the analysis and, simultaneously, requires an increasing amount of information regarding structural details and materials properties. The LV1 assessment method is useful for evaluations at a territorial scale and can provide an estimate of the ground acceleration related to the collapse. This level only requires a visual inspection and a qualitative judgment of some structural details of the construction. The LV2 assessment method involves a simplified construction-level analysis that, nevertheless, can account for the potential interaction among the structural parts of the construction and that is able to provide insights for designing local retrofitting. The LV3 assessment method involves a detailed construction-level analysis that requires the modelling of the nonlinear mechanical behaviour of the components of the construction. This assessment level requires a large amount of data and may be extremely time consuming from a computational point of view. For any level, the seismic

performance assessment should be carried out by a structural engineer with adequate knowledge about heritage and historic constructions. As an additional comment, it should be noted that the *Guidelines* refer that, for CH buildings, it is often preferable to accept a higher seismic risk, when compared to that of ordinary buildings, rather than to implement interventions in disagreement with authenticity and/or conservation principles. Still, accepting this means accepting the burden of responsibility in case an earthquake causes heavy damage or collapse of the CH asset, which may then lead to injuries or deaths. Furthermore, it also means that everyone involved should be aware of this risk and accept it.

For the case of **fire risk**, Italy is currently developing a standard addressing fire risk assessment for CH constructions accounting for their specificities. In the meantime, a guideline has been published by the Italian fire brigade [83] to address fire safety issues in CH buildings. Given the characteristics of CH buildings, it is often challenging to implement fire safety measures commonly found in regular buildings. In particular those measures are, in some cases, only applicable through invasive interventions that are incompatible with the preservation of heritage values. For such cases, the existing fire safety standard [84] establishes exceptions that allow designers to define alternative fire safety measures. Considering this, Italian fire brigade issued a guideline to assist designers in defining adequate fire safety measures for these situations. From a methodological point of view, the guideline provides help for performing a preliminary fire risk assessment (for occupants and for valuable contents) whose outcome is then used to determine the strategy and the technical solutions that will ensure a fire safety level equivalent to that of regular buildings that follows the existing standard [84]. Since the guideline is based on the most frequent situations of exception, it reminds that the proposed technical solutions are not exhaustive and might only be useful to address the more general issues related to the fire safety of CH buildings.

For the case of **flood risk**, following the operational implementation of the EU Flood Directive in Italy [85], the Italian Institute for Environmental Protection and Research (ISPRA) ("Istituto Superiore per la Protezione e la Ricerca Ambientale") has published a risk map of CH assets exposed to flood risk and landslide risk [86]. The risk maps combine the flood and landslide hazard maps developed by ISPRA for the Italian territory for different hazard levels with georeferenced data about the CH assets, obtained from the Vincoli In Rete database of the Higher Institute for Conservation and Restoration ("Istituto Superiore per la Conservazione ed il Restauro") [87], and assign a certain vulnerability level to each asset. This vulnerability level represents the expected level of damage of a given asset exposed to an event and, according to [86], was conservatively set to 1 for all assets, on a scale defined between 0 (no damage) and 1 (total loss), due to a lack of data about the individual CH assets.

Finally, reference is made to the *Italian risk map* project ("Carta del Rischio") of the Ministry of Cultural Heritage and Activities and Tourism (MiBACT) ("Ministero per i Beni

e le Attività Culturali e per il Turismo") [88]. The *Italian risk map* is a georeferenced tool that was developed to identify actions that need to be implemented to protect CH assets across the country. This tool does not provide guidance on the type of structural interventions that should be implemented but ranks the assets according to their priority. The mapping strategy considers a multi-hazard approach and the physical vulnerability of each asset by estimating its potential damage. For each asset, the risk is defined by a combination of hazard and vulnerability. The hazard component describes the level of threat (independent from the presence of the built environment) and is divided into three components:

- Environmental - accounts for weather, microclimate and pollutants in the air, and is described by variables that can be connected to the physical degradation of the surface of the materials of the assets (namely leading to erosion, blackening, or physical stress).
- Structural - accounts for natural phenomena that can affect the stability of a building (e.g. earthquakes, landslides, flooding, coastal dynamics, avalanches, volcanic activity), and is related to the degradation of the mechanical properties of the structure of the asset.
- Anthropic - accounts for socio-demographic dynamics, and is related to the potential degradation of the asset due to dynamics connected to human activities either directly (e.g. theft, vandalism,) or indirectly (e.g. population density, tourist flow patterns).

The vulnerability component describes the level of exposure of a given asset to external threats and is also divided into three components:

- V1 - which reflects aspects connected to the surface of the materials of the asset and is defined by variables that are related to the state of conservation of the surface, based on the urgency, severity and extent of the potential damage.
- V2 - which reflects aspects connected to structural components and is defined by variables that are related to the state of conservation of the structure, based on the urgency, severity and extent of the potential damage to each structural component.
- V3 - which reflects aspects connected to the maintenance and safety of assets and is defined by variables that are related to the use and the safety of the asset.

Although the concept appears to be interesting and wide-ranging, the publicly available information about the details of the risk quantification process is scarce and, from what was able to be determined, it is not clear if the vulnerability component of the assets is not estimated in an overly simplistic way for some of the hazards that are considered.

As a result of the cooperation between the civil protection and multiple Italian institutions, several **post-disaster** damage survey forms were specifically developed for immovable and movable CH [89]. Some of the better-known forms are those developed

for post-earthquake damage survey of churches and palaces, which also have different versions depending on the level of details that is required for the damage survey. Aside from these, forms were also developed for ground settlements and extreme weather events. For some of these forms, detailed manuals were also developed to help filling the requested data, e.g. see [90]. For the case of damaged immovable heritage assets, these forms normally collect general information about the asset (location, owner, contacts, typology, dimensions, construction materials, etc.), about its damage and estimated vulnerability. The forms also collect information about the use and access restrictions that need to be enforced (safe, unsafe, partially safe where safe and unsafe zones are identified within the asset). This data is normally collected by experienced professionals from different fields (structural engineering, architecture, history, conservation, civil protection, etc.) and is then used to develop the necessary measures for immediate and temporary stabilization of the damaged CH asset, as well for the development of more definite repair/recovery solutions.

On the topic of temporary stabilization, reference is made to the field manual *Schede Tecniche di Opere Provvisionali* [91] developed by the fire brigade division of the Italian Civil Protection and that contains a set of information sheets for emergency shoring operations, illustrating the most common design solutions to secure damaged buildings, as well as the necessary construction details. The purpose of this manual is to make the definition of on-site emergency shoring works implemented by fire brigades easy and practical, starting from the earliest stages of the emergency. In the case of CH assets, similar stabilization solutions can also be implemented, but generally under the guidance of professionals with experience in CH. The stabilization solutions that are included in the manual were identified by taking into account the means and the techniques used by the Italian fire brigades, the type of materials that are usually available and issues related to building operations, e.g. safety of workers, simplicity and speed of implementation, etc.

With respect to disaster response procedures related to CH, two additional aspects are further highlighted, which are relevant in the case of earthquakes. The first point is related to the Italian Decree-Law 189/2016 Art. 28 [92] that establishes provisions for the treatment and transport of materials deriving from the collapse of buildings due to earthquakes. For the case of CH, this law is complemented by *Annex 1 of the Circolare 53 2017* [93] published by MiBACT that provides procedures for the removal and recovery of the rubble of protected properties and historic buildings. This rubble is classified into three types: A – of listed heritage assets, B – of historic assets, C – of assets of no cultural significance. Type A rubble should be preserved in-situ as much as possible, while types B and C must be transferred to temporary deposit sites for a more detailed identification and selection of relevant cultural or architectural elements. The general objective of this process is to recover cultural or architectural remains that might be reused in the future restoration of heritage assets and historically relevant constructions. This reuse of materials and elements is then expected to help places

affected by earthquakes in regaining their sociocultural identity. In theory, the process of identifying and selecting this rubble is expected to be fast. In practice, however, this process is complex and involves significant amounts of rubble to go through. Certain researchers who analysed this issue mention that faster procedures were put in place after the October 30 2016 earthquake [94], while others [95] refer that, in some locations, damaged historic centres were cleaned and razed without any consideration for these historical remains. Rushing the collection of these remains can contribute to the loss of identity, values and collective memory. However, time is a critical factor in post-earthquake recovery scenarios due to multiple socioeconomic factors, as well as other external factors (e.g. weather conditions). The right balance is, as in most cases, difficult to achieve.

The second point is related to the safe housing of rescued movable CH assets from damaged or collapsed constructions, as well as of the previously referred recovered heritage remains. These rescued movable CH assets and heritage remains require adequate facilities for safe temporary housing and restoration. Available information from the emergency actions carried out after the 2016 earthquake series [96] highlights that such facilities were not available throughout the affected regions, thus delaying the recovery operations, and that not all of the available facilities had suitable characteristics to safely store these items. For example, following the 1997 earthquake, Umbria constructed a 5000m^2 earthquake-safe storage facility equipped for conservation and restoration of different types of artworks, archives and books. Following the 2016 earthquake series, it was able to house close to 7000 movable assets, as well as rubble remains recovered from damaged heritage assets in the region. On the contrary, movable assets recovered in the Marche region were stored across multiple facilities where some do not possess adequate storage, preservation and safety conditions.

After the 2016 earthquake series, specific legislation was published addressing **recovery and reconstruction** issues related to the historic settlements that were heavily damaged. Simultaneously, MiBACT established a working group to define specific approaches for the reconstruction of historic centres damaged by the earthquakes. Within the context of the *Circolare 53 2017* [93], guidelines for post-earthquake reconstruction defined by the referred working group were also published [97] to establish the admissible contexts for the reconstruction of damaged buildings in historic centres. One of the main points highlighted by the guidelines is that these historic centres are an essential component of Italian cultural and landscape heritage and of the identity of the affected locations. Therefore, the guidelines encourage the reconstruction of the damaged areas in their original location (instead of creating new settlements as was done in some situations after the 2009 L'Aquila earthquake), following approaches that are based on the needs of the affected communities. The type of recovery interventions proposed by the guidelines involve:

- Repair and recovery of historic and monumental buildings.

- Partial reconstruction of buildings with cultural elements or architectural remains that were salvaged by the process referred in Section 4.2.4.
- Complete reconstruction in compliance with the values and the characteristics of the original building (volume, spatial arrangement, morphology, material, structure, etc.), either as close as possible to the original building, or involving a reinterpretation of the original building.

Furthermore, the guidelines also highlight that reconstruction should consider measures to increase the safety of the building in order to prevent similar damage situations in future earthquakes, as well as measures to ensure their energy efficiency and thermal comfort. According to the contents of these guidelines, it should be noted that the reconstruction of monuments in historic centres is not addressed.

5.6.3 SPAIN

As far as could be determined, no specific guidelines or manuals developed by Spanish institutions or authorities were found to address the topic of **risk assessment** in CH. Still, some of the actions that are being developed by the regional CH emergency management units created by several Spanish Autonomous Regions such as Murcia and Castilla y León, involve the publication of guidance documents related to risk management for CH. As an example, reference is made to the *Guide to fire prevention in buildings of heritage interest in Castilla y León* [98] that provides simple guidance on how to prevent or reduce the risk of fires, as well as on how to act in the case of fires in order, for example, to safeguard heritage collections and other movable heritage elements. In addition, the guide also lists safety guidance on how to reduce the risk of fire during renovation works in a heritage construction, particularly for situations that may involve hot works.

In 2015, Spain published a specific legal framework to address **DRR** issues for CH in the form of a *National Emergency and Risk Management Plan for Cultural Heritage* (*NERMPCH*) [99-100]. The main objectives of the *NERMPCH* are:

- To define measures to protect CH assets from disasters.
- To define resources and protocols for emergency actions addressing the rescue and safeguard of CH in case of disasters.
- To design instruments and coordination mechanisms between institutions acting in emergency situations and dealing with the safety of people and assets that integrate concerns with the safeguard of CH.

Among other aspects, the *NERMPCH* discusses the active role of national emergency units in the safeguard of CH in **emergency** scenarios. In particular reference is made to the role and capacity of Urban Search and Rescue teams of the Military Emergency Unit ("Unidad Militar de Emergencias") in the implementation of emergency stabilization measures in damaged CH and other activities for the rescue of heritage assets.

Furthermore, reference is also made to the Emergency and Risk Management Unit ("Unidad de Emergencias y Gestión de Riesgos") of the Ministry of Education, Culture and Sports whose role is to define and implement emergency actions for the safeguard of damaged CH assets of national significance.

To deal with disasters, the *NERMPCH* also recommends Spanish Autonomous Regions to create their own CH emergency management units that, in collaboration with Civil Protection and CH institutions, will then develop regional programmes and actions for risk prevention in CH and for the safeguard of CH in emergency scenarios. These units are expected to involve technicians from different public administrations that will be able to act as first responders in emergency situations that involve CH. Furthermore, these units would be also tasked with the design and implementation of preventive measures for avoiding or minimizing the consequences of disasters in CH, with the definition of research and documentation programmes that may be needed in this field, and with the definition of training and dissemination programmes that are referred in the *NERMPCH*. In general, the functions of these regional units would be:

- The development of CH risk maps for their corresponding region.
- The definition of measures that need to be implemented in emergency scenarios for the safeguard of CH, in coordination with other field agencies involved in the emergency.
- The development of emergency interventions for CH.
- The development, when needed, of Master Plans for the recovery of CH affected by a disaster and the implementation of monitoring actions associated to the interventions involved in the recovery.

Since 2015, these regional CH emergency management units were created in several Spanish Autonomous Regions such as Murcia and Castilla y León, while Castilla-La Mancha, Canarias, Aragón, Extremadura and Asturias are in the process of also developing their own. Since their creation, these units have been involved in several training and capacity building actions to train and articulate their field procedures with other emergency units (such as the Military Emergency Unit) and to provide knowledge and experience to the emergency units of different provinces of the region [101].

Finally, it is also noted that the *NERMPCH* includes, in ones of its annexes, a guide to aid heritage managers, conservators and restorers to develop emergency management plans for CH assets in their institutions [100, 102]. The guide is divided into four phases (analysis, prevention, response and recovery) and includes procedures for the implementation of the first two and protocols for the third. Regarding the latter, it is noted that these response protocols are particularly detailed but are mostly focussed on the safeguard of movable heritage assets. Actions to be carried out in the fourth phase, recovery, are not detailed since they will depend on multiple disaster-specific aspects.

Although no specific Spanish document was found to provide guidance on matters related to **post-disaster reconstruction** of CH, this issue was already addressed in the past. In particular reference is made to the recovery actions developed for the CH of the city of Lorca that was damaged by the May 2011 earthquake. These recovery actions were defined by the Master Plan for the Recovery of the Cultural Heritage of Lorca ("Plan Director para la Recuperación del Patrimonio Cultural de Lorca") commissioned by the Spanish Cultural Heritage Institute ("Instituto de Patrimonio Cultural de España") of the Spanish Ministry of Culture that was published shortly after the earthquake on November 2011 [103]. The prompt development of the Master Plan indicates clearly how significant this CH is for the city's recovery and sustainability and for the well-being of citizens. Most costs were funded by different governmental sectors and programmes (at the national, regional and local levels), the Church and the private sector, highlighting the large multi-sectorial coordination efforts that were made to implement the recovery plan for CH. The repair/reconstruction works were overseen by a management commission and a technical commission. The management commission promoted initiatives supporting the value (namely its touristic value), the recovery and the preventive maintenance/conservation of Lorca's CH, and oversaw managing resources and funding for these operations. Meanwhile, the technical commission supervised and provided guidance for all the repair/reconstruction works.

Aside from managing the recovery of heritage assets, the Master Plan also included several supporting activities under the section Auxiliary Programmes. One of these activities involved the development of a database to document and collect all the relevant data on the repair actions that were performed across the different heritage assets. Other activities of the Auxiliary Programmes involved dissemination actions of the heritage recovery process throughout its development across different media and special publications targeting different sectors of the local population on topics related to the effects of the earthquake and to the heritage recovery operations. However, some activities were specifically designed to preserve the engagement of the citizens with their CH during the recovery and to involve them with the recovery process. Among others, reference is made to activities such as exhibitions related to the recovery and repair processes, workshops discussing these processes with invited talks and practical in-situ demonstrations, and guided tours to sites of heritage assets being repaired.

Even though the Master Plan provides a significant amount of information about the CH recovery actions that were carried out following the 2011 earthquake, it does not discuss the methodological framework that was implemented or the reasons for the decisions that were taken. Nevertheless, it is believed that implementing a rapid recovery of the affected CH was seen to be fundamental for the local and regional communities, namely for their social and economic recovery. This conclusion is inferred from the prompt development and implementation of the Master Plan (whose repair/reconstruction works were officially concluded in January 2017) and given the coordination efforts made by local, regional and national stakeholders to implement the Master Plan.

5.6.4 Other countries

In **Croatia** aside from the existing legislation (Law on the protection and preservation of cultural property - Official Gazette No. 69/99, 151/03; 157/03 Corrigendum, 87/09, 88/10, 61/11 , 25/12, 136/12 , 157/13, 152/14, 98/15 - Ordinance) that says that "*Institutions carrying out the activities of protection and preservation of cultural property and owners of cultural property are obliged, during the peace period, in cooperation with the competent authority, to ensure: conditions for the protection and safeguarding of cultural property in the event of emergency (armed conflict, earthquakes, floods, fires, environmental incidents and disasters or other extraordinary circumstances)*" there are no documents. We learnt during the SHELTER GLOCAL Venice workshop that the Water Management Plan 2022-2027 might include a framework to assess flood risk to cultural properties, nothing written was found.

In **Serbia** we couldn't find any document on risk assessment for (built) CH for natural or man-made hazards, emergency preparedness for (built) CH for natural or man-made hazard, and post-disaster recovery of (built) CH. Serbia has DRM laws, but it does not integrate CH.

In **Slovenia** aside from the existing Cultural Heritage Protection Act of the Official Gazette of the Republic of Slovenia 16/2008 of 15 February 2008 [104] that states that measures and planning must be developed for protecting monuments against natural and other disasters, and in the event of an armed conflict, no other relevant document could be found.

Turkey addresses little DRM in cultural heritage, but a dozen of documents has been found and analysed. The Law on the Renovation and Preservation of Degraded Historical and Cultural Immovable Assets [105] and the Regulation on the Preparation, Demonstration, Implementation, Inspection, and Principles and Procedures Regarding the Authors of Development Zoning Plans and Environmental Design Projects [106] are somehow relevant to risk management. While the Directive Regarding the Procedures and Principles to be Followed in Arrangement, Restoration and Conservation Projects and Applications to be Made in Archaeological Excavations and Excavation Areas [107], the Regulation for fire protection of buildings [108] and its Amendment [109] and the National Earthquake Strategy and Action Plan 2012-2023 [110] are national laws by the Turkish government addressed to risk management. The analysis found also a Turkey National Disaster Response Plan on Disaster preparedness and emergency response [111]. Furthermore two documents on post-disaster reconstruction and recovery have been assessed: a national Regulation on the Establishment, Permit, Working Procedures and Principles of Protection, Implementation and Inspection Offices, Project Offices and Training Units [112] and a Principle Decision of the High Council of Protection of Cultural Assets for Registered Immovable Cultural Property Damaged in the Earthquake and the Practices to be Carried Out in the Sites and Interaction-Transition Areas [113]. It is

important to underline that those documents are not in English therefore the OL workshops will be precious to confirm or amend those results.

For **The Netherlands**, before the GLOCAL International workshop, the desktop analysis did not highlight any Dutch national document specifically related to DRM on immovable cultural heritage, due also to the fact that all the documents are in Dutch and the translation results very difficult. UNESCO relied on the GLOCAL International workshop to direct discuss with the national expert coming from Cultural Heritage Agency - Ministry of Education, Culture and Science. The expert agreed with the findings: there are no DRR/DRM-related documents that address specifically immovable heritage. Nevertheless, The Netherlands but also other countries analysed have a general cultural heritage protection law that sometimes also refers to the concept that cultural heritage needs to be protected from disaster. But those were not included as relevant documents that addresses DRR/DRM for immovable heritage. Furthermore, some countries have general DRR/DRM legislation that also mentions cultural heritage (among the multiple sectors that are mentioned). But those were not included as documents that addresses DRR/DRM for heritage. Further confirmation was given by the Dordrecht Open Lab coordinator who confirmed that there are no national binding guidelines and explain that The Netherlands does not have specific guidelines on protecting CH due to the fact that the national flood management policy is very heavily focused on prevention through dykes and embankments, protecting the vast majority of the territory. That is why there is no specific CH disaster management binding guidelines, as they are protected, just like almost all of the western part of the Netherlands by the dyke system. The Dordrecht Open Lab provided three guidelines that are not strictly related to disaster risk management on immovable cultural heritage, but could somehow be interesting. Most of Dutch documents on cultural heritage risk management addresses mostly aspects related to movable heritage and collections.

Aside from the countries illustrated above, the desktop analysis took into consideration also **Bosnia and Herzegovina, Montenegro,** but no relevant document was found at the stage when this document was drafted. However, the interactions with the Open Labs have contributed to the identification of additional knowledge that has been included in Table B of Annex I and that will be included in the ongoing version of the data gathering sheet (Annex I) during the project lifetime.

The desktop analysis also took in consideration other outstanding countries that are not belonging to the SHELTER Open Labs such as England, Greece, Portugal and Switzerland but that can give examples of regulatory frameworks addressing DRM of CH.

5.7 Gaps detected and next steps

This desktop analysis performed, though not exhaustive, provides a relevant overview of the landscape of available documents that address DRM for the CH sector (DRR, emergency preparedness and response and post-disaster reconstruction phases).

Most of the international-level and European-level documents that were reviewed only refer the importance of adopting adequate risk management practices for CH protection, highlighting also stakeholders that should be involved. Few documents address practical frameworks, methodological approaches or more detailed guidance for implementing risk management for CH. Some of the countries that were analysed have developed guidelines and legislation that can be applied to support the implementation of DRR practices for certain hazards. Still, in the overall, there is a need for better risk assessment and risk mapping procedures for CH addressing different hazard types.

Several DRM initiatives addressing emergency preparedness and response for (or that can be applied to) the CH sector were identified at the international, European and national levels. In some cases, the development of these procedures at the country-level was driven by recent disasters and the experience and knowledge drawn from these events (both in terms of CH losses, as well as in terms of preparedness/response procedures) should be shared across countries or among interested stakeholders. Aside from the need to develop specific procedures defining emergency actions for CH, establishing adequate partnerships between CH institutions and the civil protection sector is fundamental to ensure an adequate cooperation and coordination in emergency situations. For this reason, the further discussion of the review results during the next SHELTER OL workshops and the peer-learning exercises is strongly recommended.

In terms of post-disaster recovery/reconstruction of CH, most of the relevant documents covering this issue were produced at the international level. Still, these documents provide a sound basis for discussing the issue after a disaster that severely affects or destroys CH. Furthermore, it is also believed that decisions on this topic are likely to be made case-by-case and depending on the national/international significance of the CH assets that are affected. Nevertheless, pre-disaster awareness and discussion is found to be needed among those that might be involved in these decisions.

While performing the analysis and compiling the excel in Annex I, partners had several group discussions on the methodology to follow, the way how to codify some documents (e.g. topic, scale or scope of the documents) and how to be consistent with the other collections explained in Section 4, 6 and 7. Indeed, the table in Annex I shows how many gaps and unknown information on the validity frame of the documents, the fact that there is no budget allocated, no monitoring system in place, unknown results or evidences after the application of the regulation and the necessary conditions for the replicability of the conditions is missing and the barriers/obstacles for the application are unknown. Moreover, “sites” is suggested to reflect in the structure of the table as

UNESCO World Heritage Sites are one of the most important elements in the documents reviewed and analysed.

The potential of using the OL workshops within the SHELTER project framework as platform of discussion of those findings would represent an excellent basis for sharing knowledge and experiences. This analysis is not exhaustive, considering many National documents are not in English and precious would be the help of national stakeholders. The consultations with Croatian and Slovenian National Commissions for UNESCO are ongoing. Consultations with stakeholders belonging to the Open lab are planned for the next coming months (Netherlands, Italy, Sava River Basin, Spain and Turkey). The possible additional documents and the interpretation/analysis by national experts could provide complementary inputs and give a fuller picture on national knowledge of DRM in CH.

The documents reviewed at **International level** highlight the increasing importance given by international organizations concerned with CH to the need to implement adequate DRM procedures. Moreover, there has also been a growing emphasis about the importance and the need to integrate CH risk management and into general (multi-sectorial) risk management programmes and policies at the national and regional levels.

Most of the documents that were reviewed only refer to the need and importance of adopting adequate risk management practices for CH protection, referring the stakeholders that should be involved (e.g. institutions in charge of CHM, central, regional and local governments, educational and research institutions, or international intergovernmental and nongovernmental organizations concerned with CH). Reference to practical frameworks, methodological approaches or more detailed guidance on how to implement risk management for CH is only addressed by a few of these documents. Therefore, regarding the availability of practical tools, procedures or application guidelines that would facilitate the implementation of risk assessment and risk management procedures by CH managers, further developments are still required.

There are only a few documents providing methodological frameworks that can aid the implementation of these procedures, some addressing risk assessment, emergency response and recovery [15], while others target a more specific topic, e.g. [19]. In terms of documents with methods or tools for the practical implementation of certain DRM and DRR procedures, there are also only a few documents as well providing this type of content. For risk assessment, reference is made to the *Climate Vulnerability Index* (CVI) [23], addressing specific issues related to climate change impacts in CH, and to the *ABC Method – A risk management approach to the preservation of cultural heritage* [24]. With respect to the latter, it should be noted that this method was originally developed for the risk assessment of museum collections [16] and that its adaptation to immovable CH is not straightforward and maybe overly simplistic. For emergency response, reference is also made to documents such as the *Handbook and Toolkit First Aid to Cultural Heritage in Times of Crisis* [28] and the handbook *Endangered Heritage:*

Emergency Evacuation of Heritage Collections [29] who provide guidance and practical procedures for dealing with certain emergency scenarios. Still, these documents were not developed having in mind European countries. On the contrary, they are expected to support post-disaster response in countries with a reduced level of preparedness for dealing with emergencies, particularly in CH. As such, for European countries, it is believed that the coordination of these procedures with those already in place by national civil protection requires some adaptation.

The documents reviewed at **European level** highlight the increasing importance given to CH by high-level EU institutions. Still, even though reference to specific issues related to the need to implement adequate DRM procedures for the CH sector have been made by several frameworks, work plans, action plans or studies, the practical consequences of those documents have been minor and mostly in the form of recommendations for Member States. Since existing documents are mostly not in the form of policies or legislation that list measures that need to be enforced, Member States are free to implement these recommendations as they see fit. Nevertheless, it should be noted that the documents that were reviewed clearly identify what needs to be implemented to achieve robust practices towards reducing disaster risks in CH in Europe.

This landscape of recommendations for Member States covers mostly issues related to risk assessment and management. Up to some extent, some of these documents also refer issues related to emergency actions, although no specific document targets specifically this issue. In terms of post-disaster recovery in the CH sector, available documents covering this issue are also scarce. Aside from the procedures established in the PDNA chapter for the culture sector, no other document was found to address this issue specifically for cultural heritage. Furthermore, according to [77], even though the PDNA procedures have been applied in 66 disaster situations since 2008, it has never been used in a disaster that occurred in an EU country. In Europe, PDNA has only been applied in the 2014 floods in Bosnia and Herzegovina, the 2014 floods in Serbia, the 2015 floods in Albania, and in the 2015-2016 floods in the Republic of North Macedonia.

The documents reviewed at **National** level highlight how the different countries present very different levels of development on matters related to DRM of CH. A higher level of development is often seen in countries that suffered recent disasters that affected CH (e.g. Italy or Albania), thus making them more aware of the importance of developing adequate DRM policies, guidelines or procedures for this sector. This reactive nature is also responsible for the fact that a significant amount of measures developed after disasters address specifically disaster preparedness and response. Hence, except for a few cases mostly focussed on earthquake as hazard, there is a lack of adequate risk assessment tools and procedures dedicated to CH across countries and dedicated to other hazards. Some of the countries that were analysed have developed guidelines and legislation that can be applied to support the implementation of DRR practices for certain hazards

With respect to disaster preparedness and response, it is seen that civil protection emergency units with adequate knowledge to deal with CH in emergency scenarios are slowly developing in certain countries. Given the specific expertise developed by these units, it would beneficial to share their experience and their knowledge with other countries using available EU mechanisms (e.g. through the Union Civil Protection Mechanism). For this reason, the potential of the OL workshops within the SHELTER project framework would represent a perfect basis for sharing knowledge and experiences within the country or within the regions (e.g. Sava River Basin) and with a bottom up approach making them available at EU level. Furthermore, the establishment of peer-learning experiences within Open Labs would meet the need of crossing borders still focusing on the same hazards.

In terms of post-disaster recovery/reconstruction in the CH sector, available documents covering this issue are also scarce. Countries that had to deal with this situation have mostly developed policy addressing the issues involved in a specific disaster. As such, none of the SHELTER countries analysed published an official methodological or conceptual approach to this problem.

It is crucial to set up appropriate policies and programmes, and allocating necessary budget to CH disaster risk reduction, so that national and local entities are clear on their responsibility for taking measures. The process to develop legislative procedures and negotiations with the financial authorities to develop formal policies can be lengthy. However, natural hazards and climate change don’t wait for governments and public sectors to formulate necessary policies and stakeholders need to find ways to take actions in the absence of formal policies such as regulation and governmental budget. Therefore, it would be worthwhile for the project to enable the sharing of experiences between project partners on how they have succeeded in taking necessary actions in the absence of formal policies. These experiences could also be helpful in the short-term period before formal policies will be developed.

6 A collection of best/next practices and tools

6.1 Setting the scene

The SHELTER repository of best/next practices dealing in particular with HA is a fundamental component of the project data lake information model. The observatory should serve as a first knowledge base of the solutions and tools already developed and validated in previous EU project case studies. The information gathered constitutes not only a reference for the whole consortium, as stated in the Grant Agreement, but also a first guideline to be shared within the Open Labs. The knowledge will serve further as a starting point for the project, enabling the consortium to focus on developing and implementing practices in the fields detected with a few or a total lack of information. The result of the observatory is based on a critical review of the existing good practices and tools developed or collected in EU projects with relevant topics for the SHELTER project goals. The identification of best/next practices have been built on the basis of this critical review, according to the relevance to SHELTER project.

The observatory aims at identifying and operationalizing the practices proved valid in projects funded by the European Union's programmes, ensuring a consultancy that would allow to easily identify the most suitable solution for a specific situation depending on several characteristics (e.g. location, hazard, scale).

6.2 Methodology

6.2.1 Good Practices

When it comes to the good practices, the first review was based merely in the collection of deliverables outlining best/next practices coming from the project experience. This first gathering process highlighted the issue of the lack of availability of specific deliverables for a good number of topic related projects. Consequently, with the aim of reaching a repository as comprehensive and practical as possible, a second review was carried out, integrating with the collection operational frameworks, guidelines and multi-step methodologies proven valid in previous EU projects pilot cases.

Figure 24 shows the structure that has been used to collect information on good practices. The main objective of the work was to identify the relevant practices and guidelines that could contribute to the results of the project and to frame this knowledge in its structure. The literature review collection conducted in T2.1 [1] served as a starting point to collect already known EU project with topics relevant to SHELTER.

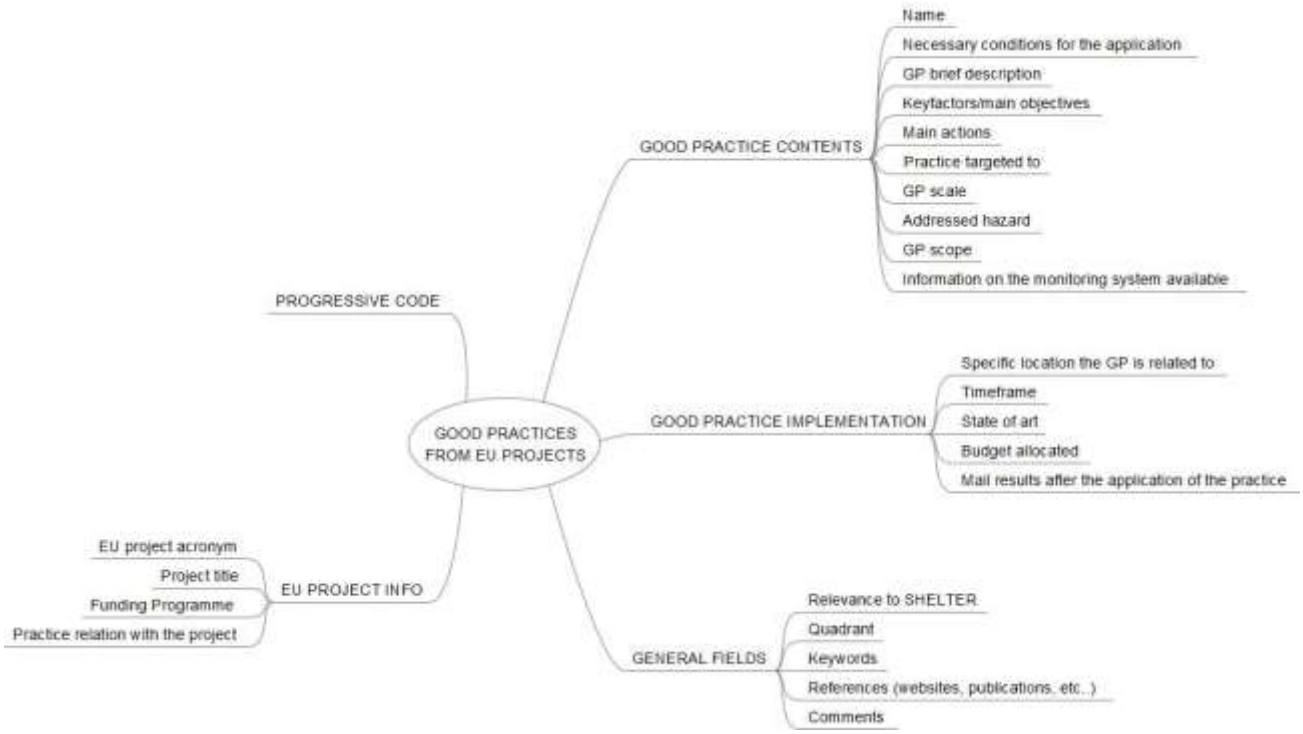

Figure 24: Structure of the "Good Practices" data gathering template

The CLIMAT-adapt Platform [2] and CORDIS data base [3] were the main tools used to undertake the research of good practices coming from European projects. The European Climate Adaptation Platform (CLIMAT-adapt), developed after a partnership of the European Commission and the European Environment Agency (EEA), shares information and data with a focus on climate change adaptation strategies, plans, tools and actions developed across European Countries funded not only by the EU research programmes but also at national, regional and city level. The key elements of the platform scanned for the research were the 'Case studies' and 'Guidance' sections. The first one allowed to detect the main results obtained in pilot cities and collect practices and lessons learned after the project methodology was applied. The Guidance section was helpful in particular to consult handbooks, operational frameworks and guidelines developed in European projects and shared after the implementation time. Notwithstanding addressed mainly to stakeholders and managers of the areas, to the end of the research, these outcomes were helpful tools to collect strategies already implemented and validated at different scales and, in some cases, already replicated in other areas after the end of the project.

As aforementioned, the observatory comprises practices also retrieved from the CORDIS (Community Research and Development Information Service) database in which the results funded by the EU's framework programmes for research and innovation (from FP1 to H2020) are collected. A combination of one or more keywords were used to scan the data base. The results were identified through a query addressed to different keyword topics:

- Practice target:
  - Disaster Risk Management (DRM)
  - Climate Change Adaptation (CCA)
  - Climate Change
  - Historic Areas (HA)
  - Cultural Heritage (CH)
  - Resilience
  - Urban Resilience
  - Security
  - Monitoring
  - Community engagement
  - Critical Infrastructures (CI)

- Hazard:
  - Heatwaves
  - Flood
  - Earthquake
  - Wildfire
  - Storm
  - Subsidence
  - Climate related

- Other keywords:
  - Early warning system
  - Risk analysis
  - Community engagement
  - Vulnerability
  - Historic building
  - Archaeological areas
  - Natural heritage

It is to made clear that CORDIS is a database collecting all the EU projects dating back to the '90s. To the scope of the deliverable, after a first scanning, it has been considered appropriate to collect practices and methodologies developed within the last 23 years. This choice was undertaken in view of the fact that the outcomes obtained from previous projects would probably have been resulted outdated and technically obsolete. In addition to this, the database used has been found to be less reliable and with knowledge gaps for what concerns projects funded before the mid '90s. Therefore, to collect exploitable and replicable strategies, projects older than FP5 (Framework Programme 1998-2002) funded projects and in general older than 20 years, were not inserted in the good practice review. After a first research on the CORDIS database, the projects web sites, when available, were scanned to retrieve more detailed information, in particular

concerning the outcomes and the lessons learned in the related case studies even after the end of the project.

Some of the projects did not propose a list single good practice but a complex methodology composed of several steps. In fact, as stated in most of the final results of the related projects, one single action wouldn't have served the same purpose if undertaken individually. For those projects proposing different steps for the good outcome of the methodology, the model was collected and considered as a whole good practice. Therefore, as also shown in Annex II reporting all the records collected, some of the good practices are actually a multi-step methodology.

As a remark, the template included a column dedicated to the budget allocated for the specific practice. However, it was possible to retrieve such information for very few of the collected practices, as mainly the indication of the costs available in the database referred to the total budget of the project and not to the single practice or methodology.

6.2.2 Tools

For identification and analysis of international projects in the sense of tools applied in EU projects and linked R&I initiatives, a specific template (Annex III) was developed. The structure of this template is visualized in Figure 25. The aim was to structure the available information via using several databases and project descriptions in a way that the creation of a "bigger picture" of the existing tools is possible.

The description of the structured template is as follows:

- The PROGRESSIVE CODE is a designation to assign the identified content.
- The R&I INITIATIVE INFO consist of 5 specific cells to give an overview of the identified initiatives.
- In the TOOL INFO the relevant content for the analysis are gathered.
- In TOOL TECHNICALITIES AND REPLICABILITY there are 4 possibilities to specify the identified tools concerning to limitations, interoperability, DRM phase and rate of update.
- The cluster with GENERAL FIELDS describes the relevance to the SHELTER project and amongst others the assignment to the defined quadrants.

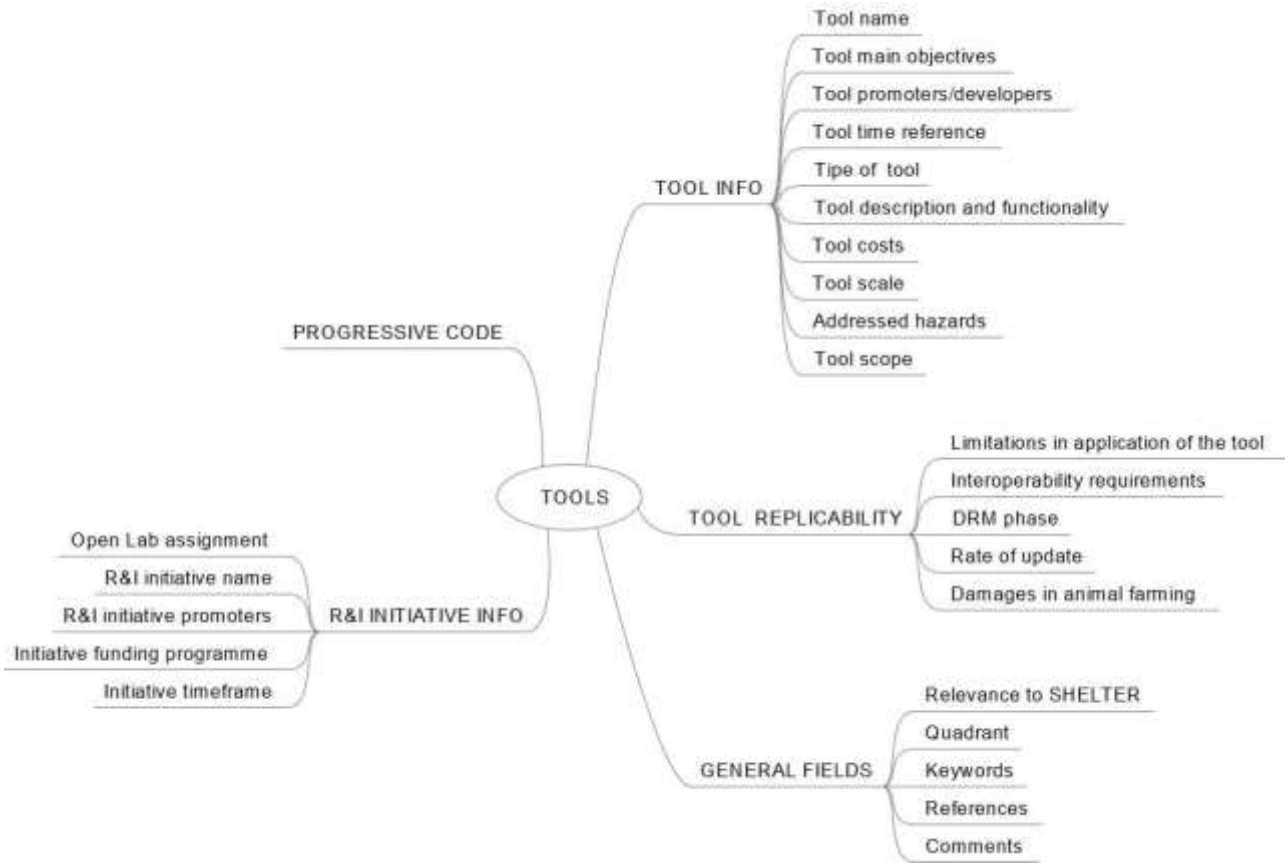

Figure 25: Structure of the "tool" data gathering template

Nearly 100 tools have been examined by using three data bases to search for projects: CORDIS (EU) [3], INTERREG (EU) and KIRAS (AUT). KIRAS was used by CRCM to test the data gathering template. Main attention was then given to CORDIS, complemented by INTERREG. As far as the data in CORDIS are concerned, R&I initiatives was identified covering the period from H2020 back to FP3 (Framework Programme 1990-1994); records on projects sponsored under FP1 (Framework Programme 1984-1987) and FP2 (Framework Programme 1987-1991) are seemingly not available on CORDIS. No other science data bases or search engines were exploited so far as CORDIS would still offer more projects to be included in SHELTER's gathering of existing knowledge at the current point.

As far as the completeness of the collected data is concerned, it is estimated that two thirds of the projects available in CORDIS have been identified and including mostly of the projects of high priority for SHELTER. No estimate can be given for the status on INTERREG. Exploiting the KIRAS data base was stopped by CRCM after the testing phase of the template when the T1.2 team agreed on collecting only data of European realm projects that are fully available in English.

The approach has been a quantitative one, yet the data exploited and listed in the Annex III cannot be considered an exhaustive representation of all the available knowledge in terms of tools, especially for the Framework Programme (FP) 1-8.

Main search terms were the following:

- cultural heritage
- climate change
- disaster risk management

After a first search with these three terms, the results were seemingly limited and subsequently expanded by using the terms:

- natural hazards
- flood
- storm
- wildfire
- earthquake

6.3 Graphical representation of the results

This paragraph aims at representing the results obtained in the good practices and tools' research, undertaken as just explained in the previous part of the chapter.

Starting from the analysis of documents' contents, **Error! Reference source not found.** shows that the majority of good practices and tools' scale (i.e. 65% of the cases), documents refer to multiple scales.

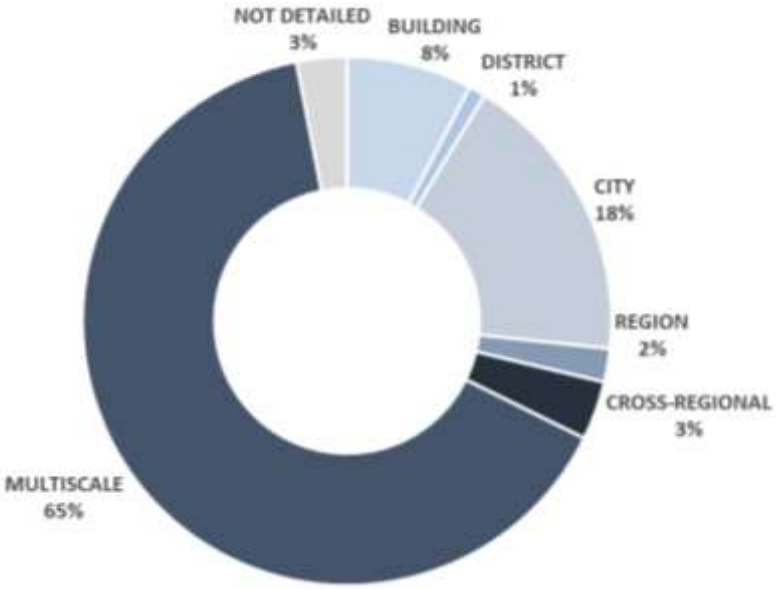

Figure 26: Good practices and tools' spatial scale

Furthermore, Figure 27 shows that all the scales are almost equally represented and none of them prevail on the others.

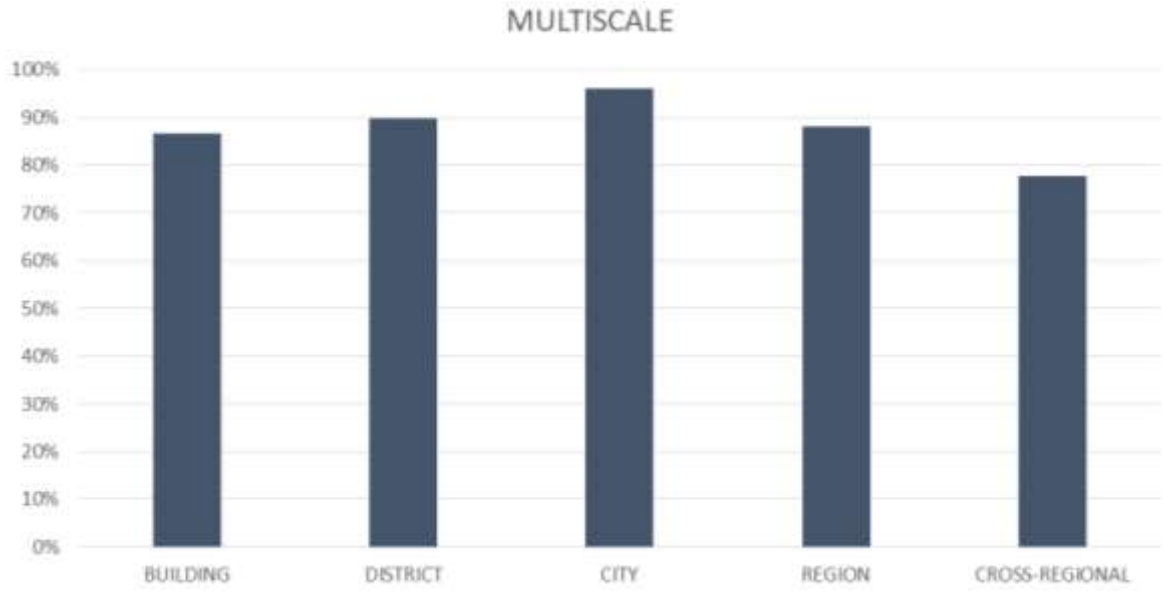

Figure 27: Specification of multi-scale's composition of good practices and tools

For what concerns the type of hazard that good practices and tools refer to, Figure 28 shows that 31% of them refers to more than one hazard, but it is also possible to see that 22% addressed to floods and 11% isn't related to a specific hazard.

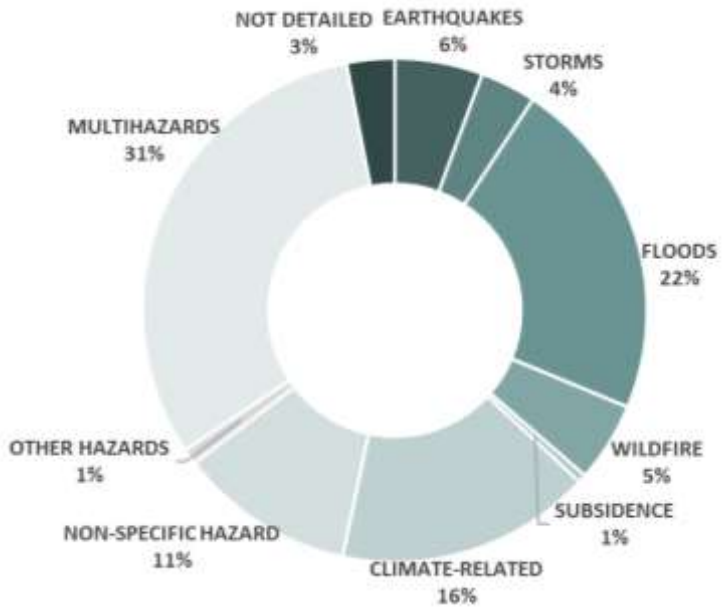

Figure 28: Hazards addressed by good practices and tools

Floods are not only the protagonist of 22% of the EU projects identified, but they are also the most prevalent among 31% classified as multi-hazard, as shown in Figure 29; therefore it is possible to point out that more than a half of the knowledge collected refers to floods.

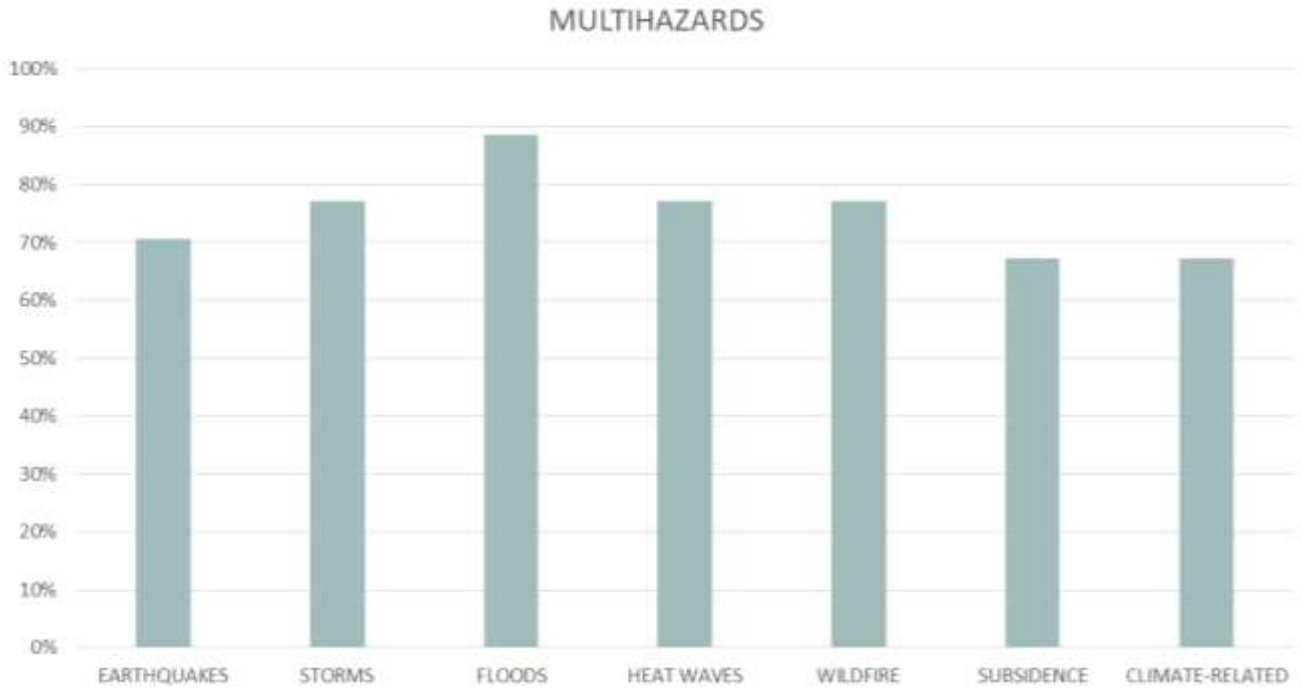

Figure 29: Specification of multi-hazard's composition of good practices and tools

In addition to the type of hazards analysed in the different documents, it is possible to define a specific quadrant in which insert them, referring to the object scale they deal with. Results are shown in Figure 30. 47% of items refers to a specific hazard and urban/territorial scale (QB) and 29% refers to the same scale as the previous ones but they are related to non-specific hazards (QD).

When it comes to the contents of the good practices and tools, the multi-scope feature is the most present with 93% of the total, as shown in Figure 31. In addition, Figure 32 specifies which scopes are relevant in case of multi-scope practices and tools, and it is possible to see that about 60% of them are social and economic ones.

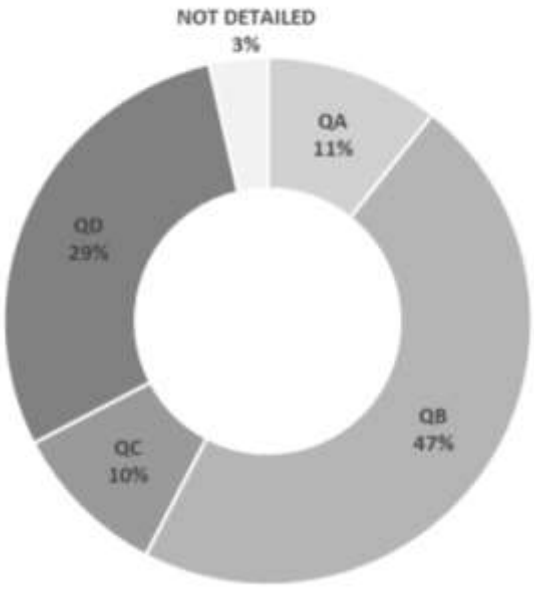

Figure 30: Good practices and tools' resilience conceptual framework distribution

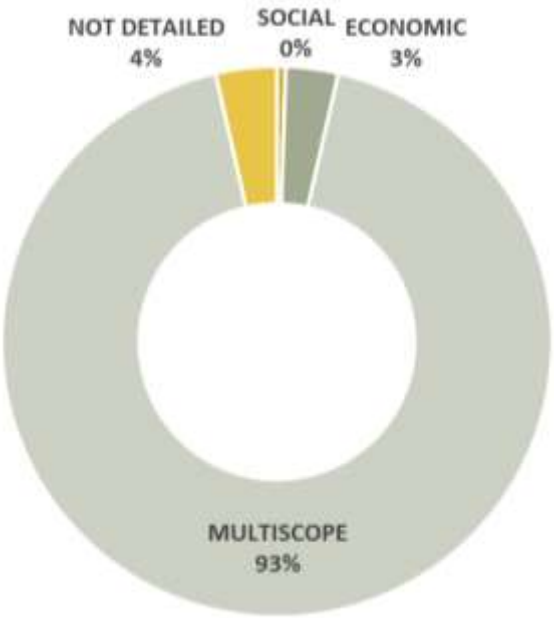

Figure 31: Resilience dimensions that good practices and tools refer to

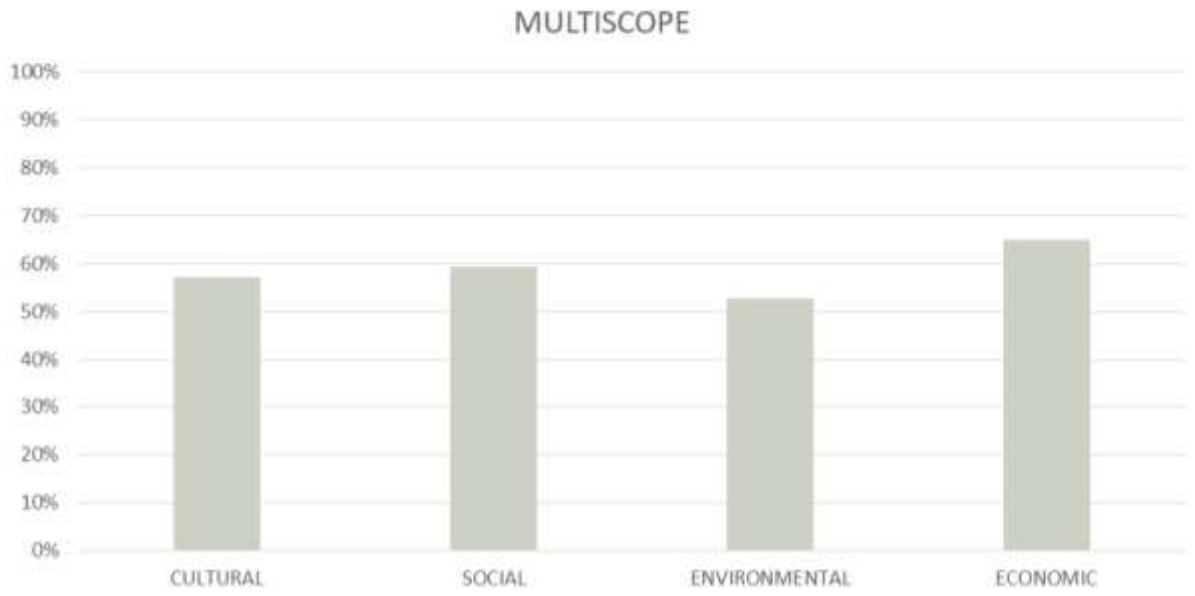

Figure 32: Specification of multi-scope's composition of good practices and tools

Figure 33 shows that 43% of good practices and tools has a high relevance to SHELTER project and only 15% of them is considered with a low relevance.

Figure 34 and Figure 35 display some additional information about the EU projects to which good practices and tools belong. In particular, 73% of projects is already finished and 51% of good practices and tools belongs to Horizon 2020 funding program which represents the majority.

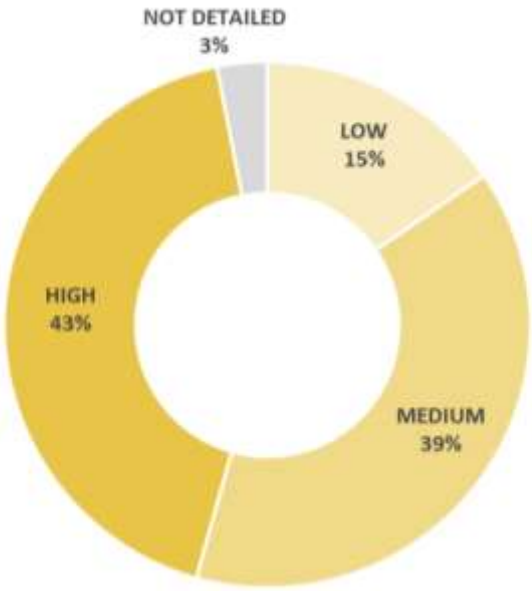

Figure 33: Good practices and tools' relevance to SHELTER distribution

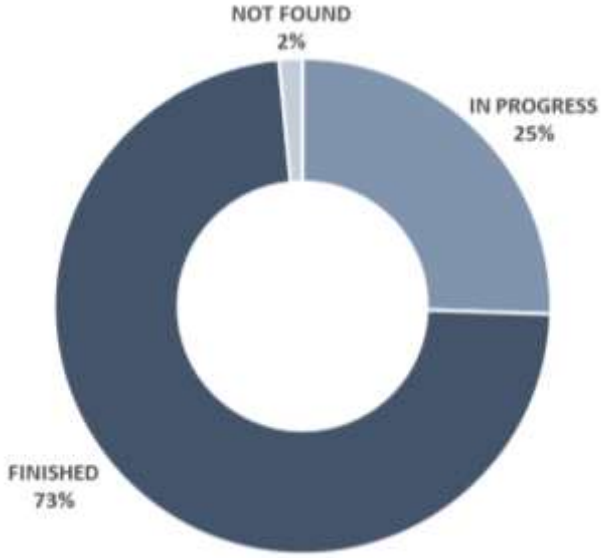

Figure 34: Status of EU project good practices and tools come from

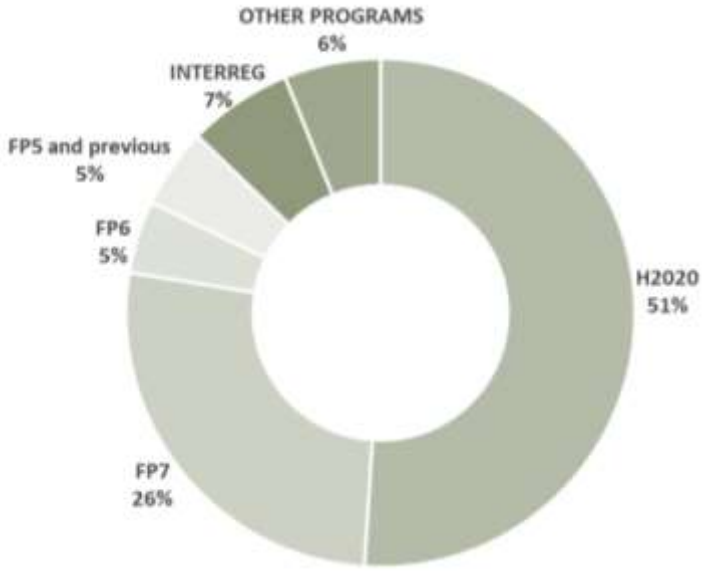

Figure 35: Funding programs of EU projects from which good practices and tools belong to

Lastly, keywords have been analysed. As shown in Annex II (good practices) and Annex III (tools), the Excel tools included a column in which keywords linked to the input were listed. Figure 36 and Figure 23 shows that "*cultural heritage*", "*stakeholder*" and "*preparedness"* have been the most frequently used keywords highlighted by the research. The font size represents the use frequency.

Figure 36: Main keywords highlighted by the research

6.4 Best practices

The result of the research is, therefore, a collection of 94 good practices coming from related EU projects, of which 82 were found of medium or high relevance for SHELTER. The outcome of the observatory can be consulted in Annex II.

Over the last 20 years, the importance of involving stakeholders and citizens in the DRR process has grown in awareness and, as shown by the observatory, several projects developed practices addressed to this topic. Nowadays, it is clear that stakeholders are the key factor in the DRM process as the direct actors relating with the HA. On the other hand, commonly widespread is the "safe-guarding of territory mentality", as pointed out by the ESPREssO project [4], which often leads to uncoordinated action with consequent waste of the available resources. During the first phases of work within case studies, several projects detected a partial or total lack of communication and coordination among the stakeholders involved in the study areas. As a consequence, risk assessment resulted fragmented and incomplete thus leading also to a partial inefficiency especially during the emergency and response phases, as each intervened mainly under its own interest. A fundamental step, to be undertaken before even beginning the planning phase, is to share the information and data owned by each stakeholder in order to detect any knowledge gap. To determine the level of preparedness and coordination of stakeholders the CORFU (FP7) [5] and SMR (H2020) [6] projects applied the 'maturity level' concept. This tool allows, after a check of a list of actions already undertaken or not, to identify the level of cooperation of CH managers, security bodies, municipality. The model provides five levels of 'maturity', each proposing action to be completed by

stakeholders, up to the point where resilience and preparedness is integrated in the Municipalities planning. The simplicity of the model proposed makes it very handy to propose to stakeholders as a preliminary evaluation of the current management frameworks of the city. In fact, as many bodies and actors participate in the process and it is of fundamental importance that all of them act under the same purposes.

When looking at the observatory, as aforementioned, the importance given to stakeholders is made very clear. Nevertheless, the importance of involving actors from several and various sectors in the DRM has grown in awareness. In fact, a great number of the practices consulted insist on the necessity of engaging expertise outside municipalities and CH managers to have a more complete view of the risks and obtain a deeper analysis of the situation. The DERRIS project (LIFE+) [7] proposed a process of involving insurance companies to support climate change adaptation actions in small and medium size enterprises. The public-private partnership allowed to raise risk awareness through the insurance companies' knowledge and to integrate climate adaptation considerations in management and operational procedures. The CLIMAbiz project (LIFE+) [8], on the other hand, focused on integrating financial impacts of climate change in the process of quantifying risks. The outcome was the development of the Climate Risk Management Tool which allows to identify the climate risk for businesses economically speaking. In addition, one step of the SHIELD model, validated in the ESPREssO project (H2020) [9], considers it necessary to cover the knowledge gap between science and policy. The recommendation is for local governance to develop policies and agreements with Universities, corporations and research groups to be guided in actions where deep and technically advanced expertise is required. In addition, more in general the ENHANCE project (FP7) [10] states the importance of multi-sector partnerships, involving the private and public sector and the civil society organisations to be more prepared in the fight against the natural hazards. The partnerships established in the project case studies actually proved the cooperation potential to significantly improve DRM, especially when it comes to the long-term planning. Therefore, though not directly addressed to Natural and Cultural Heritage, these practices underline the need of a new approach to recommend to stakeholders, governance and CH managers. The general advice is then to widen the 'small' group of actors usually involved in the DRM process and include groups of expertise from several fields of research. Combining these different points of view would hence provide an overall view of the situation, consequently facing the widespread climate-related hazards with a more comprehensive planning.

Among the practices collected, a very broad group includes the use of the new technologies to be used in several phases of the DRM. In particular, both the CARISMAND (H2020) [11] and Clim-ATIC (Interreg IIIB - NPP) [12] projects underline the several fields of applicability for these new tools. Nowadays, almost everyone is in possession of a smartphone and can access easily to social media or targeted apps, although it should be acknowledged that not all the territories have the same level of connectivity

readiness. This assumption allowed the Clim-ATIC project to test a people-centred early warning system, in addition to the more 'traditional' ones. The phoned within a certain distance to the hazard received text and/or voice messages, allowing to initiate the evacuation more promptly and to provide citizens with guidance on the precautions. Though the warning exercise proved the solution to be valid, the system was not implemented after the project due to budgetary restrictions. On the other hand, the CARISMAND project identified strategies already in action in several countries for these technologies proven helpful during the DRM phases. The institutions social media channels (e.g. Facebook, Twitter, Municipality web site) can be used to spread the alarm and reach a great number of citizens immediately and afterwards, through the same tools, information on good behaviours could be sent to citizens during the whole emergency phase. To be as efficient as possible though, it would be good that Municipalities planned the communication strategies in advance and activated training session addressed to key stakeholders to be prompt in using these resources when necessary. Moreover, the channels could be used to teach citizens 'good practices' and behaviours even before a disaster occurs. At the same time, the research on web, apps, social media allow the systems to locate an event though people were searching information about it. This would help the Municipalities to detect even the small events, such as floods in a restricted area or the beginning of a fire. As a remark, a common obstacle to the mentioned use of the new technologies is that citizens should enable the localisation of the device and accept to provide personal data to the authorities. In conclusion, if the actions of using these channels were undertaken transparently to citizens by institutions, they would undoubtedly be useful and cost-effective tools to be used in the DRM phases.

Finally, among the good practices collected, many have stressed the value of creating digital simulation models. Projects like NIKER [13], ProteCHt2Save [14], SMR [15], FloodProBe [16] have tested and validated the numerical contribution models can give to risk assessment in relation to different hazards. These obviously require a certain level of experience in order to be realized, but they afterwards allow to identify through digital simulations the different scenarios that may arise at the time of a disaster event. These tools can be used in various fields based on the methodology approach: first of all, to locate the most vulnerable areas, thus producing risk maps for the areas concerned; to identify the critical infrastructures inside the high risk areas and identify the network interdependency; further, they can be applied to individual buildings to verify their response to certain events. The common limit found is that of not being able to predict exactly the behaviour of the citizens through the numeric models, a fundamental element for the good management of the event. Despite this, in all pilot cases, it has proved to be a useful tool at the service of administrations, especially as a basis for long-term planning and as adaptive as possible according to the various scenarios [13, 15, 16].

The possibility for the majority of the projects to test the methodology developed in pilot cases allowed to detect the limits and the lessons learned of most of the practices

proposed. Therefore, the outcomes of the models, when specified in the deliverables, are further indication of the success or problems one specific solution could lead to and the obstacles for its success. This helped in completing the 'obstacles' column provided by the Excel tool and also allowed to identify good practices easier to replicate.

When analysing the observatory under the point of view of hazard related practices, the majority of results are addressed to floods, a hazard currently deeply studied and with a great variety of solutions and methodologies available validated in pilot cases.
Eleven practices specifically related to earthquake were collected, and 8 of them regarded the building/district scale (QA). Only three are framed in the urban/territorial scale (QB) quadrant, promoting field observations and morphological analysis at a wider scale.
The totality of practices addressed to storms and wildfire are framed in the QA quadrant, while the one collected in relation to subsidence is related to the QB one.
Noteworthy, 20 out of 94 total good practice are 'non-specific hazard' related. These practices target mainly stakeholders and community engagement good practices and even when tested in a specific location they could be theoretically applied to every type of hazard.

For what concerns the status of the good practices found during the research, Figure 37 shows that 82% of them is already implemented and just 15% is in progress.

In addition, Figure 38 shows that 56% of good practices considered are already validated and demonstrated and 35% of them is not totally documented but inspiring and promising.

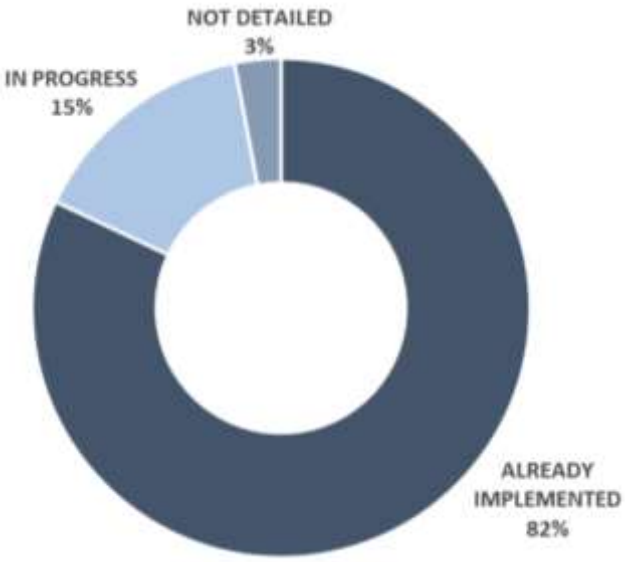

Figure 37: Good practices' timeframe of implementation

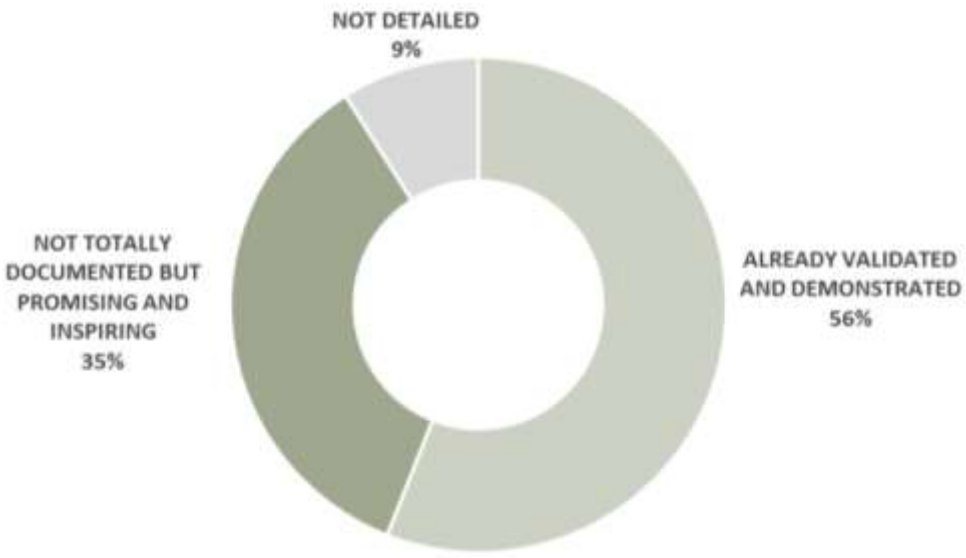

Figure 38: Good practices' state of art

The practices collected can be synthesised in the following indications:

- **Stakeholders meeting and training.** It is fundamental to gather the several actors and define the key role each one brings to the DRR process. This is to be done periodically and update the situation and outline new possible tools available. This is essential not to waste time and resources in all the DRM phases.

- **Promoting the use of technology and social media**. The use of these "new" tools was found very useful in many projects, not only for proper use of the stakeholder but also to include citizens in the process and raise awareness of the risks for each area. This approach was also proven valid in the response and recovery phases in some of the studies analysed.

- **Inclusion of several level of expertise.** Promoting the planning level at different scales (national to local) is one of the first steps for a real preparedness in case of emergency. Furthermore, undertaking agreements with Universities, scientific experts, corporations would ensure a very deep level of skills.

- **Exploitation of the new technologies and social media channels in the DRM phases.** Bearing in mind that a large number of citizens can be reached thanks to these technologies, it is necessary to be ready to use them as much as possible and to include them in the city management plan.

- **Realization of risk maps, also with the help of simulation numerical models.** These tools help authorities to identify high-risk areas, CI network interdependencies and to prepare for different scenarios in relation to the scale of the event.

6.5 Tools

The repository is a collection of 99 tools developed within previous EU projects, 47 of which are considered strictly related to the SHELTER project themes. Following are presented some of the most relevant tools collected among the ones considered of high relevance for SHELTER and for which detailed information were available. The complete list of the review can be consulted in Annex III.

Some of the projects focused on a single hazard for which specific tools were designed and developed, such as the research of the CENTAUR project [17] focused on the development of an autonomous system to alleviate the risk of local flood in urban areas. The project developed a system that works by installing a Flow Control Device (FCD) which responds to water level measurement and sends wireless communications. The monitoring system warns of high-water levels at a flood prone site and the available capacity upstream. It can then be decided to activate the FDC closure and store the water, reducing the flow and water levels at the flood risk site, minimizing the likelihood of flooding. The communication system, powered by solar energy, can be connected to nearby infrastructures, such as street lamps, is very flexible and quickly deployable. Therefore, the strength of the CENTAUR system is to be operational without the need for structural changes to the existing drainage system and sewerage system, unlike more common flood related systems.

The FP7 IMPRINTS project [18] aims at contributing at life loss and economic damage reduction by improving preparedness and operational risk management forecasting flash floods and debris flow. The tools designed within the project are specifically designed to be used for flood risk management responsible practitioners. The result is an early warning operational platform in which hydrogeological warnings based on the forecasted rainfall few days in advance and weather radar networks forecasted few hours in advance are collected. The platforms consequently provide the available information about vulnerability and flooding risks, thus constituting a full early warning system. The IMPRINTS platform can be considered a major development to support the EU's Flood Directive implementation and to develop plans targeting flood risk management.

The MICORE project [19] aimed at the development of reliable mapping of the morphological impact of sea storms and the development of early warning systems to prevent and reduce disasters related to this hazard in the long term. The project-transcending database OpenEarth developed within the project, allowed to store and manage data, model system and analysis tools from multiple projects and to be used later for future research, preventing effort and economical expenditure to retrieve data.

The data collected were afterwards inserted in a WebGis system which allowed to determine storm risk mapping of the morphological impact of marine stormsand, Storm Impacts Indicators and the production of early warning and information systems to support long-term disaster reduction.

The objective of the STORM project [20] was to create critical decision-making tool for all CH stakeholders affected by climate change and natural hazards. The result of the project was a cooperation platform to collaborative collect and enhance knowledge on CH. The result is a set of new forecasting models and non-invasive and non-destructive investigation methods such as new sensors (intra-fluorescent and wireless acoustic sensors), legacy systems, state-of-the-art platforms (including LiDAR and UAV), as well as crowdsourcing techniques, offering applications and services on an open cloud infrastructure. This enables effective prediction of environmental change and to more easily identify threats and conditions that could harm cultural heritage sites.

More in general, the H2020 IMPREX project [21] has contributed to the prediction and management capabilities in coping with water related natural hazards, developing new approaches and tools in 10 European case studies. One of the main outcomes is the production of periodic hydrogeological risk outlook for Europe which incorporate the dynamic evolution of hydroclimatic and socio-economic processes. This can be obtained thanks to dynamic model ensembles, process studies, new data assimilation techniques and high-resolution modelling leading to improve forecast skill of meteorological and hydrological extremes in Europe and their impacts which were validated during the project.

Among the specific hazard related tools, the S2IGI (Sistema Satellitare Integrato per la Gestione Incendi) project [22] focuses on the management of fire, with the aim to the support for operative activities. The project developed a specialised software application based on satellite technologies, with the exploitation of the Copernicus data and the resolution of weather patterns. The ONDA platform is able to operationally compute and provide end users the burned areas estimate through change detection analysis.

On the other hand, several of the tools analysed targeted more in general climate change related hazard, as for example CLIMATE FOR CULTURE (FP7) [23] which investigated the effects of climate change on European cultural heritage and focused on solutions to mitigate these effects. The union of high-resolution climate modelling with building simulation tools allowed, for the first time ever, to visualise scenarios of the climate changing effects not only on historic buildings themselves but also on their interiors and artefacts. A mixture of experimental monitoring techniques was used to determine the risks to cultural heritage. In addition to the more traditional ones (e.g. laser interferometry, investigations), techniques from previous EU projects, NOAHS ARK [24] in particular (see below), were used to determine the assessment of corrosive environments with highly sensitive glass sensors dosimeters. Furthermore, a software algorithm was developed to collect digitalised data such as changing of analogue

temperature and relative humidity and a database with set of data from more than 100 historic buildings was created to identify the concept of 'generic building'. The comparison between the building's generic data and the constant monitoring of the internal conditions allows to determine the changes and variations in values due to external climate change. The result is a collection of 55,650 climate and risk maps derived from the study of high-resolution climate projections that can be used to mitigate and assess the impact of climate change in Europe and around the Mediterranean. The solutions obtained and validated in the project study regions could also be replicated in areas with similar climate and extended also to other field of research.

The aforementioned FP 6 project NOAHS ARK [24] created a network of tools and a stakeholder targeted database to help identify threats, allowing to run different scenarios and evaluate strategies effectiveness. The advisory panel established by the project developed a set of recommendations and guidelines for managers of historical areas to address weather phenomena on four themes: rainwater and drainage infrastructure, effects on structures, internal/external interaction and effects on building materials. Maps were also prepared under the project framework, collected in the Vulnerability Atlas, which combined information on cultural heritage with information on weather risks. The maps outlined the areas at greatest risk where deterioration of buildings was most likely to occur.

IPERION CH [25], funded under the H2020 programme, aimed to establish a unique European research infrastructure for the Heritage Science dedicated to the management and conservation of Cultural Heritage, integrating national world-class facilities and research centres, universities and museums. IPERION CH's gives heritage scientists access to three platforms that bring together knowledge of first-class facilities: MOLAB, for portable laboratories; FIXLAB, for large facilities; and ARCHLAB, for technical and scientific data archives. The project also included Joint Research Activities, focused on improving existing structures, training activities, and dissemination of research and innovation. In particular, the research activities focused on improving diagnostic tools in the field of cultural heritage.

The work started by the project is being continued in IPERION HS [26] - which has just started and can be considered as a valuable partner for SHELTER - which aims at providing cross-border access to knowledge platforms and the development of high-level scientific tools, methodologies, data and tools focused on knowledge and innovation in the study and conservation of heritage.

The HERACLES project [27] aimed at design and validate solutions for enhancing resilience of CH against climate change with a holistic and multidisciplinary approach. The identified technological solution comprised in-situ sensors, aerial data and satellite data in an integrated manner. The platform generated is replicable in other scenarios, thus being able to be customized for specific cases on the basis of the basic knowledge already included, proposing both concrete solutions for the protection of CH (preventive

maintenance, conservation, restoration actions) and the use of materials developed customized for specific needs. The user interface is based on geographical location allowing easy access to the collected data immediately inserted in the context of the site, while the alert system established on appropriate thresholds allows the efficient planning of operational interventions on the site.

The pan-European A4EU platform, developed in the framework of the ANYWHERE project [28], aims to support decisions related to extreme climate risks. Thanks to the platform it is possible to identify in advance disaster events that could lead to deaths and economic losses and is therefore a useful support at local level, national, regional, local authorities as well as public and private operators of critical infrastructure. Integrated advanced early warning systems allow to help exposed communities to minimise risks in the shortest possible time. The platform automatically identifies in advance the most critical areas at risk, including their location, allowing operators to respond promptly in the emergency phase.

The H2020 CRESCENDO [29] project saw the collaboration among Earth System Modelling (ESM) groups, Integrated Assessment Modelling teams and experts in ESM evaluation, projection and feedback analysis to improve models and tools for projections of global climate change. The final goal was to improve the realism and capabilities of 7 European earth system modelling in order to increase the reliability of future Earth system projections. The project produced a set of future projection of the earth system, thanks to the coupling of more earth system modelling, therefore providing more reliable and high-resolution versions of the projections in response to future CO2 emissions.

The H2020_Insurance project [30] focused on bring into the increasing society resilience process the insurance sectors. While previously the risk modelling tools were analysed within individual companies, thus preventing the possibility to compare climate risks, the Oasis Loss Modelling Framework, the system developed in the project, allows to combine climate services from several companies with loss and damage information. The operationalised system provides a standardised risk assessment process that permits to identify not only potential losses and the most vulnerable areas but also quantify the financial losses for the modelled scenarios. The scheme focuses on several fields, not only the heritage one, such as the prediction of hospital admissions for diseases related to climate, new methodologies to asses local flood damages, forest fire scenarios in relation to windspeed. The open source catastrophe modelling platform and relative Framework has already been adopted by the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) to improve climate risk resilience for an international collaboration.

Within the framework of the RESIN project [31] three tools and one guidebook, collected among the GPs, were developed to help stakeholders in the DRM process. The tools cover different aim and DRR process phases and are all available online open access with a very immediate interface. The first tool is the Adaptation e-Guide in which information,

guidance and insights are collected in support to authorities during the development of adaptation strategies and plans. It is also possible to visualise which among the tools provided by the project is the most suitable for each situation and stage of the process. The European Climate Risk Typology is the second tool proposed by the platform, encompassing an interactive map through which is possible to compare climate risk in European regions and cities. The map collects a wide range of data and indicators, covering different aspects of climate risk, to support climate change risk assessment and the development of adaptation and resilience strategies. Lastly, the third tool developed by RESIN is the Adaptation Option Library, a searchable database storing information and all sorts of adaptation measures and solutions addressing to all climate related hazards.

The I-REACT project [32] within the three years of work developed the first European-wide platform. The system is able to integrate not only emergency management data input from multiple sources, such as European monitoring systems, forecasts, historical information but also those provided by citizens through new technologies as crowdsourcing, social media and the mobile app developed within the project framework. Therefore, the comprehensive platform is able to produce fast and handy information and allow all the DRM actors and citizens to be effective in preventing and reacting to disasters. The result is a system build on separate services which can be exploited singularly or as a whole, supporting stakeholders in the phases of disaster prevention and management, policymakers in the planning and decision-making processes and citizens in providing first-hand information. The system was released as an Open Access platform, accessible and available through the project website.

Moving towards a general analysis of the information found concerning tools, the main database questioned to collect data on tools related to SHELTER project is CORDIS, as mentioned in paragraph 6.2.2. The availability of information in the project pages found there can be summarised as follows:

- R&I initiative info:
    - OL assignment: this column was entered secondary at a later stage of research and ignored for the time being
    - Name: available
    - Promoters: available
    - Programme: available
    - Timeframe: mostly available
- Tool info:
    - Name: available
    - Main objectives: available, often very general
    - Promotors/developers: hardly available, mostly the project coordinator is referred to; in several instances no name is available
    - Time reference: not available

  - Type: often several products have been produced within an initiative, and in several projects the tool finally produced seems to differ from the aim at the outset of the initiative
  - Description and functionality: available, sometimes rather general
  - Costs: never available
  - Scale: mainly uniform multi-scale
  - Hazard: for general initiatives/tools mainly uniform multi-hazard
  - Scope: for general initiatives/tools mainly uniform multi-scope
- Tool technicalities and replicability:
  - Limitations and barriers in the application: not available
  - Interoperability requirements: not available
  - DRM phase: not available
  - Rate of update: not available
- General fields:
  - Relevance to SHELTER: sometimes difficult to estimate
  - Quadrant: rather uniform
  - Keywords: While there is no standardised keywords system for all FP projects documented in CORDIS since its launch, it offers a keywords taxonomy since H2020. Project proposals can pick up keywords from this taxonomy but can also add so-called free keywords. Nevertheless, there is no obligation to use keywords though, which explains why also some H2020 projects do not have them. Therefore, for the purpose of this investigation, the keywords used in FP project proposals were used whenever available on CORDIS and they were freely added when they were not available on CORDIS
  - References/websites/publications:
    - It is not reasonable to list publications as some project information does not contain any publication, some does contain a list with e.g. 30 publications or more.
    - Websites are listed if available, about every second project runs a website, many don't. Some websites are not listed in CORDIS but can be found when you google for it.
  - Comments: was not used for the moment

To understand the result of the investigation on the tools regarding information not available or detected, it makes sense to reflect on the data basis exploited for completing this subtask. The structure, nature, and completeness of the information available on CORDIS are determinative for the quality and completeness of the information gathered by CRCM. Each project page is uniform in structure through all FP 3-8. The name of the project is always in the head frame. The info box in the right frame contains the standardised core information on the project:

- Short name;

- Grant agreement ID;
- Project website: this information is often missing, even if the project runs a website. In some cases, the website URL listed here is outdated. And some projects never run websites. All of this causes additional time to be invested when one explores the projects and exploits the data;
- Status;
- Start and end date: available in almost all cases;
- Funding programme: available in almost all cases, but obviously rather heterogenous and not accurate in several cases. e.g. H2020-EU.3.5.4. vs. H2020-EU.3;
- Overall budget and EU contribution: available for all projects; nevertheless, the overall budget of a project as well as the corresponding EU contribution is in no causal relation to the final tool cost. Therefore, it was considered not relevant in the context of the analysis of tools;
- Coordinating institution: = promoter. Collecting the personal names of the tool promoters/developers was considered useful for the future work of SHELTER to allow quick and direct contact to a person in charge for a tool. Yet, person names are not displayed on CORDIS due to the personal data protection restrictions. Anyhow, it is possible to contact all the H2020 project coordinators via the contact form on the project pages which were also collected (Annex III).

The main body of the page offers room for at least 4 tabs

- Fact sheet: always available;
- Reporting;
- Results;
- News & multimedia-

The service of these tabs is extremely heterogeneous in quantity and quality. Many projects provide only the fact sheet, some only two tabs; only a few projects provide information in all four tabs. Some projects provide result information of half a page, others of about 20 pages. Many project pages lack keywords. The completeness of information on projects websites differs enormously. Therefore, not all information originally considered to be interesting for SHELTER are available on CORDIS and therefore documented in Annex III.

The nearly 100 different R&I initiatives (or projects) identified and analysed are allocated to 38 different funding programs (Table 5). The funding programs are shown in the following Table. The by far most initiatives – 53 in number – were funded by HORIZON 2020/FP8 (with 7 projects allocated to H2020-EU.3.6.3.1. and 6 projects to H2020-EU.3.6.3.) followed by 20 projects funded by FP7 (6 each in ENVIRONMENT and PEOPLE). So, about 50% of all projects that have been analysed in this activity, have been

conducted within the past 6 years – an enormous growth in knowledge with a comparatively short time to which SHELTER is contributing to.

Two specific columns - "tool costs" as well as "tool time reference" - could not be identified based on the information available in the data bases.

The promoter/coordinator (person) could not be identified in 42 cases, about half of them in projects funded by H2020 (Table 6). Yet, the template of CORDIS does not offer a field where the person name could be provided. This information, if available can be found either in CORDIS as a reference in the text of the Fact sheet or Result or on a project's website as an organisational or contact information.

The terminology used for the tool type is extremely heterogenous through all initiatives and funding programmes. There are seemingly no norms neither with the ERC nor in EU scholarship. Used terms are largely vague so that by reading the objectives as summarized e.g. on the Fact Sheet of a project in CORDIS it is in several cases even not clear whether the anticipated tool is ICT in nature or not. So, a "platform" or even a "communication platform" does not necessarily have to be an ICT platform but e.g. an institutional communication network. Several initiatives set out for producing more than one tool and for even none but producing data and knowledge in the sense of lessons learned. Table 7 lists the tools developed – with multiple checks for single projects possible.

The widely interrelated groups of modelling systems and forecasting/monitoring/(early)warning/control/decision support system are dominating tools, all together 43 in number. Second are the interrelated groups of databases and platforms/portals with 28 in number. Explicit AI, as well as VR/AR solutions, are surprisingly low, each 1 in number.

Funding programme	Number of identified initiatives
FP3-ENV 1C	1
FP3-ESPRIT 3	1
FP4-ENV 2C	3
FP4-INNOVATION	1
FP5-EESD	2
FP5-IST	1
FP6-COORDINATION	1
FP6-POLICIES-3.6	1
FP6-SME	1
FP6-SUSTDEV	3
FP7-ENVIRONMENT	6
FP7-IDEAS-ERC	1
FP7-PEOPLE	6
FP7-SECURITY	4
FP7-SME	1

FP7-SPACE	1
FP7-TRANSPORT	1
H2020-EU.1.2.3.	1
H2020-EU.1.3.1.	3
H2020-EU.1.3.2.	5
H2020-EU.1.3.3.	3
H2020-EU.1.4.1.2.	1
H2020-EU.2.1.6.	1
H2020-EU.3.	3
H2020-EU.3.2.4.	1
H2020-EU.3.5.	4
H2020-EU.3.5. and 3.7.	1
H2020-EU.3.5.1.	3
H2020-EU.3.5.4.	2
H2020-EU.3.5.6.	1
H2020-EU.3.6.	3
H2020-EU.3.6.3.	6
H2020-EU.3.6.3.1.	7
H2020-EU.3.7.	5
H2020-EU.3.7.5.	1
H2020-EU.3.7.6.	1
IC-COST	1
KIRAS	5

Table 5: Funding programmes of identified R&I initiatives

Funding programme	Unidentified promoters
H2020	20
FP7	7
FP6	4
FP5	3
FP4	4
FP3	2
IC-COST	1
INTERREG	1
total	42

Table 6: Promoters and funding programmes

Tool type	number
AI	1
VR/AR	1
hardware	1
dashboard	1
social media	2
physical barrier	3
software	3
3D	3
conference, personal or institutional network building	4
mobile application	5
satellite	5

map	6
aerial vehicles, drones, robots, robot-man-interfaces	6
GIS	7
handbook, guidelines	7
no physical tool, knowledge, lessons learned, coordination	7
training, training programme, capacity building	10
database, index, inventory, search engine	13
ICT website/platform/portal	15
forecasting/monitoring/(early)warning/control/decision support system	17
model, modelling system	26

Table 7: Tool types of R&I initiatives

Two projects are already highlighted in the SHELTER proposal and are of high relevance to the project (Table 8). Nevertheless, both were completed several years ago.

short name	programme	timeframe	Tool type
CLIMATE FOR CULTURE	FP7-ENVIRONMENT	2009/11/01-2014/10/31	elaboration of a more reliable damage assessment by connecting the future climate data with whole building simulation models and new damage assessment functions
NOAHS ARK	FP6-POLICIES-3.6	2004/06/01-2007/05/31	network of tools and a database of information for stakeholders to evaluate threats, run different scenarios and predict the effectiveness of various strategies

Table 8: Statistics of application

As a preliminary result of the survey on tool type it can be concluded among the more successful or more promising R&I initiatives a combination of modelling system and forecasting/monitoring/(early)warning/control/decision support system are more dominant. To a larger extend these systems or combinations of systems are based on GIS and/or satellite services. For every second of these projects the results are also turned into programmes of training or capacity building on expert as well as on community-based level. Handbooks and guidelines are also often an outcome of these projects.

It is also remarkable that solutions regarding social media as well as mobile applications are seemingly not so often objectives of these projects. And as said above, AI and VR/AR is still scarce.

The columns on application – scale, hazard and scope – show a very homogenous result (Table 9).

Application	Number
multi-scale	88
multi-hazard	52
multi-scope	87

Table 9: Statistics of application

The homogeneity of the result may derive from the fact that almost all of the initiatives listed here have been funded by EU's FP and therefore follow in research objectives and overall design the calls by the EC that are rather broad and embracive in nature. Including projects funded by other research programmes, e.g. national programmes might be much more specific and might show a more heterogenous result regarding the variety of application.

The fact that the category of scale is so homogenous being multi-scale in 88 cases might be explained by the fact that project promoters tend to follow an inclusive approach in order to enhance the chances of their submissions to be granted. The same might be true for the category of scope.

The category of hazard is less homogeneous (Table 10) as two hazards are objects of research of several initiatives: wildfire and flood. Projects on wildfires have been predominantly coordinated by institutions from Southern European, Mediterranean countries. Projects on flood by countries at the Atlantic of North Sea.

As a result, regarding current R&I initiatives that are of high relevance to SHELTER and deal with particular hazards, either flood or wildfire the following three initiatives are to be highlighted (Table 11).

hazard application	number
Multi-hazard	52
wildfire	8
flood	26
other	9

Table 10: Hazard application – R&I initiatives

short name	programme	timeframe	Tool type
PyroLife	H2020-EU.1.3.1.	2019/10/01-2023/09/30	integrated training program
S2IGI	H2020-EU.3.	2019/09/01-2020/02/29	software tool for fire management
FLOODARC	H2020-EU.1.3.2.	2019/04/01-2021/03/31	high-impact flood database

Table 11: Current R&I initiatives of high relevance on wildfire and flood

6.6 Gaps detected

When it comes to collected good practices, the main gaps identified are related to two relevant hazards for the SHELTER project: subsidence and heatwaves. During the research, several projects related to heatwaves where encountered but only in relation to health, and in particular to open air workers. These practices, after a first analysis, were not recorded in the observatory as are not of interest of the project. The study of heatwaves related to Natural and Cultural Heritage are very few and should be for sure

implemented to help especially the SHELTER Turkish case study affected by this hazard. For what concerns subsidence, a similar situation was identified. In fact, only one of the practices collected target this hazard, probably since the concept of subsidence is still quite a recent one and became subject of studies mainly in the last decades of 20th Century.

It should be noted that many of the deliverables and information on the Projects web site present a lack of completeness of the information. Although considered 'promising and inspiring' (as inserted in the Excel sheet) and these should be taken into account as a basis for their implementation, more data would be needed for their replicability. As a remark, the template included a column dedicated to the budget allocated for the specific practice. However, it was possible to retrieve such information for very few of the collected practices, as mainly the indication of the costs available in the database referred to the total budget of the project and not to the single practice or methodology. In addition, in relation to some of the practices, neither information about the monitoring system are available. Therefore, it is to specify that in order to replicate and implement them, it would be appropriate to have this information at a higher level of detail.

Even after the consultation of the two databases, the collection presents some acknowledged gaps mainly due to two main factors:

- The project web site is no longer active. The deliverable is not even available on CORDIS, and no information was found on the CLIMAT-adapt platform.
- In some cases, the list of deliverables was available on the project web site, but the ones related to good/next practices and methodology were not open access.

To be specific, 20 further projects were investigated and found related to SHELTER topics thanks to the description available in the project pages on CORDIS. This issue was detected mostly in relation to some of the older projects. It was considered important that the observatory should consider these projects anyways, keeping trace of those for which no information was available for download meanwhile related to SHELTER. The mentioned projects were therefore collected in the data gathering sheet (see Annex II), specifying the reason the related practices were not described. In addition to these already completed projects, 5 projects with SHELTER-related themes that are still ongoing and for which deliverables on good practice have not yet been produced have been tracked in the Excel table. However, they have been included as records in order to continue monitoring the progress of these projects.

When it comes to the knowledge gathered concerning main tools, the results show an extremely broad range of European research on protecting people, critical infrastructure, property in general as well as cultural property against natural hazards, be it explicitly due to climate change or not.

As a general remark, it must be highlighted that the information available on CORDIS (or other comparable data bases) on each single project does not allow to fill in all the information requested in the data gathering template. In particular, the information available on CORDIS are too limited for what concerns tool technicalities and replicability and it has not been possible to fill in that part of the template.

In addition, some of the information required in the template was sometimes difficult to retrieve. As already mentioned, the review was undertaken with a quantitative approach. Therefore, in order to collect as much of the tools as possible, for those cases that required a considerable effort and time it was decided to proceed further with the research.

Therefore, no striking larger gaps can be detected through all topics and themes of relevant research through FP funded projects documented in CORDIS. At the same time, the result shows that SHELTER pursues a state-of-the-art approach that is most comprehensive, embracing and including basically all topics ever addressed in the past and current R&I initiatives – with many opportunities to continue best practice research building on or complementing or replacing tools already available or to interact with current R&I initiatives pursuing complementary objectives.

6.7 Next practices

The SHELTER good practice and tool observatory aimed at gathering existing knowledge in order to establish an operational basis for the next steps of the project. After the review of the collected practices, the areas for which solutions are already available and those where gaps still exist were clarified. Notwithstanding, even those practices identified as 'best' are not always a unique solution to future problems that may arise. Their applicability, their replicability, the timeframe in which they have been considered a valid approach are fundamental components for them to be identified as 'next practices'. The shift from those 'best practices' already identified to those 'next' still to be implemented is necessary for a methodological advancement that combine and network those solutions that are considered valid and can be improved.

The collection objectively highlighted the need to actively involve both public and private bodies in the process of fighting climate-related hazards. Previous projects have tested this approach, however, with partnerships addressed at a single sector at a time (finance, insurance, technical experts), without being able to test in a single solution an approach that uniquely encompassed these different inputs. The variety of experts present in the consortium and the possibility to interface with local stakeholders in the Open Lab countries will, therefore, be an opportunity to test these partnerships in a more complete way.

Likewise, the importance of exploiting new technologies has proved to be a winning factor in previous European projects in areas where these solutions have been tested, both as an institution-citizen exchange and vice versa. The participation in the project of partners who have already contributed in previous EU projects to develop targeted technologies and developed this approach, will be an opportunity to implement and continue the work already validated on dedicated platforms, also on the basis of previously identified limits.

Furthermore, as mentioned above, the collection shows a substantial lack of solutions to interface with hazards such as subsidence and heatwaves. For what concerns subsidence, as a still relatively recent risk, monitoring techniques that show its progress are available, but few long-term solutions have yet been identified. This is certainly also related to the lack of the adaptive long-term urban planning concept in many administrations. As regards heatwaves, this phenomenon has been studied in depth in relation to the health of citizens and workers. However, currently little to no knowledge and solutions are available and applicable in the field of Natural and Cultural Heritage. Therefore, the lack of solutions for these hazards will need to be addressed in the coming years of work within SHELTER.

As mentioned before, during the research phase, 6 still ongoing projects studying topics related to SHELTER were encountered. Among those only two pursue an holistic approach to enhance resilience in Historic Areas, ARCH (Advancing Resilience of Historic Areas against Climate-related and other Hazards) [33] and HYPERION (Development of a Decision Support System for Improved Resilience & Sustainable Reconstruction of historic areas to cope with Climate Change & Extreme Events based on Novel Sensors and Modelling Tools) [34], SHELTER sister projects. In addition, four more (STAND4HERITAGE, STABLE, RAMBEA, CLAYONRISK) instead focus on studying the seismic assessment of built heritage and one (IDeal RESCUE) addresses to the assessment of critical infrastructures in the emergency phase. Notwithstanding, as related to climate hazards and cultural heritage even the outcomes of these projects are of great interest for SHELTER. Therefore, all these projects will be followed, and the outcomes strictly monitored.

6.7.1 A pilot case: cultural heritage attribute database for Sava River Basin Open Lab

Among the 5 Open Labs selected as SHELTER case studies, the Sava River Basin Open Lab has shown a quite advanced level of the available information in terms of Disaster Risk Management and hazard monitoring already before SHELTER was launched, at least for what concerns the preservation of the related natural areas. For definition of the flood risk and potential adverse consequences for all flood receptors in fact, there were enough available input data in the expected spatial format. Anyway, the cultural-historical heritage located in this OL region was still missing a geospatial format. Such gap originally raised within the development of the Flood Risk Management Plan (FRMP) for the Sava River Basin coordinated by the International Sava River Basin Commission

(ISRBC). Consequently, an effort to integrate the already existing information with attributes data related to the CH component looks necessary. To this aim the ISRBC has addressed the SHELTER WP1 coordinator with the following request:

"*.. SHELTER will provide templates/formats for collecting and storing data, information and knowledge that will be extracted from relevant institutions. The templates will be shaped according to Sava GIS requirements in order to easily translate the information gathered into datasets* ".

Following this request, a mock-up for defining a CH attributes template has been designed in the framework of Task 1.2. The WP1 partners showing expertise in CH assets cataloguing have been involved in the design process.

The collected data will be checked, refined and consolidated in a properly structured way for storing in the GIS of the Sava River Basin for processing and managing by the Sava Geoportal [35] and related web-based tools to be able to create and support services-based data exchange.

In the mock-up design process, the following criteria have been taken into account:

- **Scalability**. The database template should be designed to be scaled both in terms of variety of CH assets (in their tangible and intangible forms) and in terms of variety of parameters
- **Flexibility**. The database template must be flexible enough to be adapted and integrated into existing systems
- **Reusability**. The database template must be made of both specific components to match the SHELTER scope and generic components to be reused for other purposes beyond SHELTER
- **SHELTER oriented**. The database template must contain tables and parameters concerning the risk management for natural hazards and local resilience reinforcement.
- **Interoperability**. The database template must be designed implementing those standards, rules, ontologies that can make the CH assets catalogue comparable and accessible similarly to the others CH assets catalogues in Europe (possibly worldwide)

The SHELTER partners involved in the design of such CH assets database template are UNIBO, POLITO and UNESCO.

The mock-up design process has been based on:

1. The review of CH assets catalogues in literature [36, 37] and of existing and mature national CH assets catalogues (*e.g.,* Italy)
2. The design of a draft
3. The comparison of such draft with the first outcomes of SHELTER tasks concerning the Disaster Risk Management and the historical events.

The result of this process is presented in the following sections where the mock-up design workflow is described in details, starting from the integration of the initial ISRBC contribution with UNIBO output, then including SISTEMA and UNESCO contribution and finally collecting ISRBC feedback on the preliminary mock-up version (*release 1.0*) and integrating them in the final one (*release 1.1*). All the intermediate steps of the workflow are represented in schemas, which have been submitted to ISRBC together with textual descriptions, references and eventual suggestions on how to further proceed with the database implementation. Figure 39 shows an overview of the mock-up in its intermediate version (*release 1.0*) where the contributions of all partners have been integrated (see Annex V for a more comprehensive description).

At this level of the design process the CH attributes template represents a quite generalised version that can be used as a basis for other SHELTER OLs in the future.

The final version of the mock-up has been named as *release 1.1*, which represents the evolution of *release 1.0*, after integrating ISRBC final contribution. Through these last integrations the mock-up has been turned into a more customised template for Sava OL, which is the scope of ISRBC initial request.

Figure 40 summarizes the methodology that has been applied for the Sava River Basin OL, with its steps schematically described in detail in the next sections. The proposed workflow is designed in a way that can be replicated in its procedure and applied to further case studies.

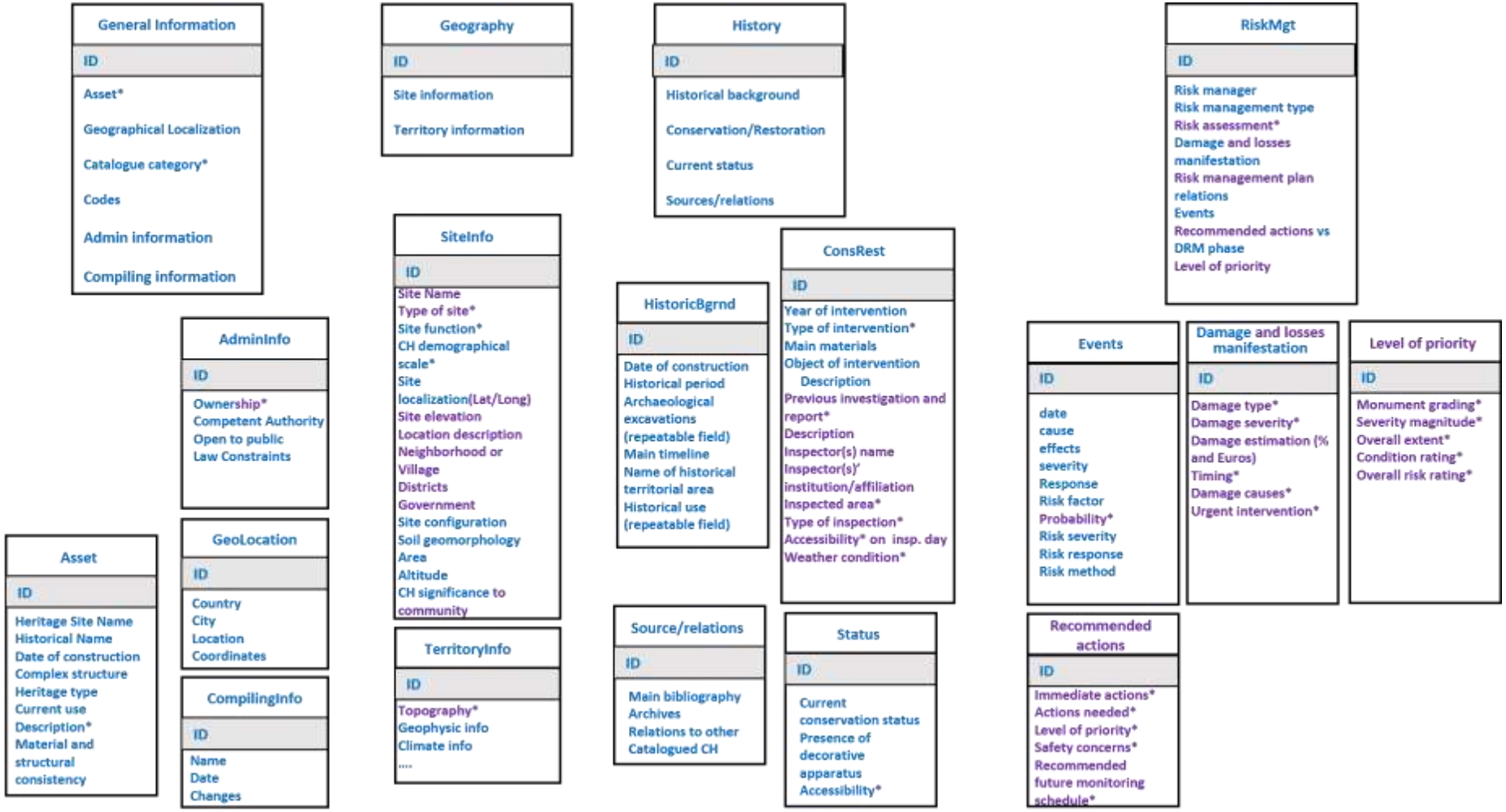

Figure 39: CH attributes tables of the mock-up (release 1.0) proposed under ISRBC request (*in blue: SISTEMA+ISRBC+UNIBO contribution, in purple: UNESCO contribution*)

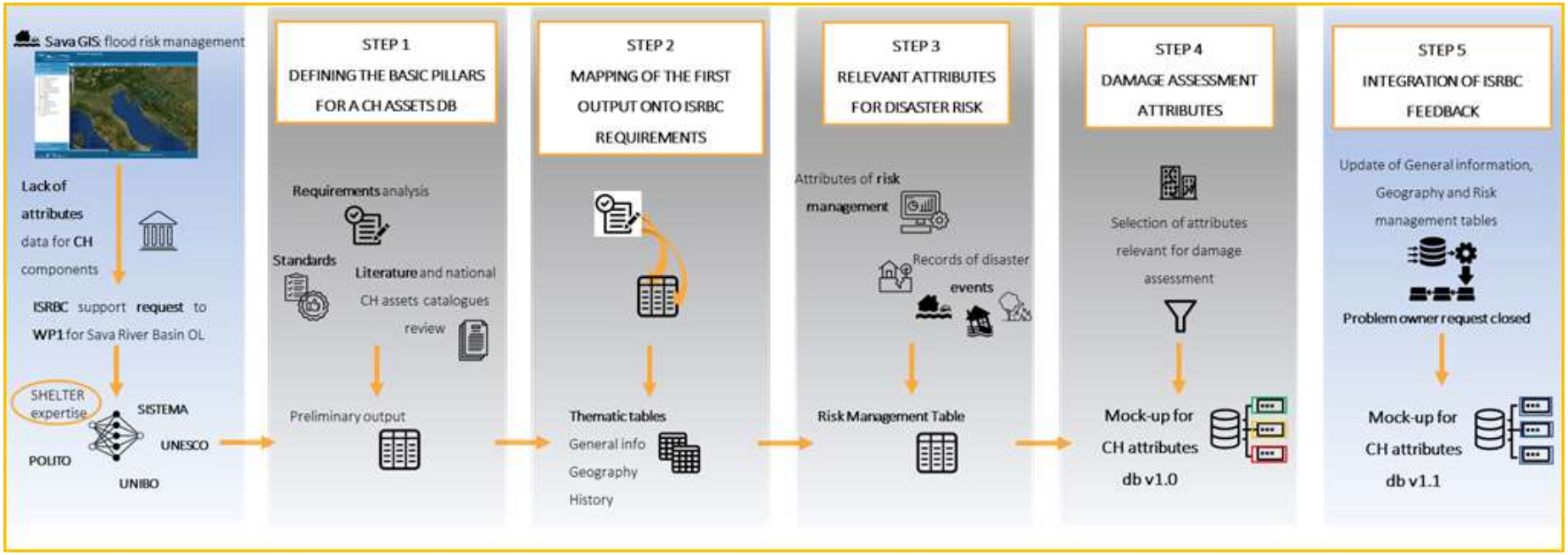

Figure 40: – Methodology steps for the definition of a CH attributes template: Sava River Basin OL as a pilot case

Mock-up design process: step 1 and 2

During the first step of the mock-up design process, the fundamental properties characterising a CH assets database have been discussed, with a particular focus on DRM [38]. The second step is represented by the output proposed by UNIBO [39, 40, 41] which has been mapped onto ISRBC requirements (Annex V, Figure A- 1).

In this first draft of the database template the main pillars are quite evident:

- The **separation of the contents** in different thematic tables with attributes organized per scope. Such separation represents a way to ensure the flexibility and the scalability of the database. Tables and attributes can be added, removed and modified singularly with a reduced impact on the whole system. All the tables must have the possibility to add links to other existing data sources strictly connected to the parameters.
- The ***General information*** table contains the administrative information, the local, national and international asset codifications, geolocation information and the records of the authors of each entry in any of all the tables included in the database. This table must be kept generic (from which the name '*General information'*) since it should contain basic information about the asset. In this way the table can be used outside and beyond the SHELTER project, like for example as part of a national CH database for tourism, for urban planning etc.
- The ***Geography*** table reports the geophysical information including the natural hazards affecting the asset and the related territory.
- The ***History*** table reports information about conservation and restoration of the asset. This table includes parameters and sub-tables describing status, interventions, materials and bibliography about the asset.

The draft initially proposed by ISRBC has been mapped on this preliminary schema to show in which way the proposed attributes have been considered and exploded in different tables.

Mock-up design process: step 3

The third step of the process consists of a further evolution of the draft proposed by UNIBO taking into account the criteria above described. The new draft, indeed, introduces a new table fully dedicated to the risk management where all the attributes and sub-tables have been reported and linked (Annex V, Figure A- 2).

With respect to the previous draft database template the '*Main hazard/risk'* table has been replaced by a parameter describing the territory and moved to the dedicated risk management table.

The '*Territory'* attribute is meant as the description of the external and boundary geophysical parameters of the territory surrounding the CH asset.

The *'Risk Management'* table includes the methodological attributes of the risk management process and a sub-table dedicated to the records of events concerning the risk.

Mock-up design process: step 4

The fourth step of the process consists on a further evolution of the scheme through the integration of UNESCO proposal (Figure A- 3, Annex V) [42].

Such proposed template includes a number of attributes collected from various UN damage/condition assessment forms coming from field offices, as these include specific fields that are important to take into consideration in disaster risk contexts [43, 44, 45 for public literature resources from UNESCO).

The provided information has been reviewed and integrated in the previous version, taking into account the already existing attributes and concepts and describing the suggested values in details, where necessary (see attributes with asterisk).

As shown in Figure A- 3, Annex V, the final version of the proposed database includes 4 main tables (hereby named *'Root tables'* – Figure A- 4, Annex V), which represent the template core both in version 1.0 and in 1.1: the *'General information',* the *'Geography',* the *'History' a*nd the *'Risk Management'* tables, already present in the preliminary version and further extended after UNESCO contribution.

Figure A- 5, Figure A- 6, Figure A- 7 and Figure A- 8 of Annex V show how the abovementioned *'Root tables'* are expanded in the related sub-tables and list the suggested values for the attributes that can have more than one possible value (in these schemas all tables, values and attributes in *red c*olour refer to ISRBC forthcoming contribution received during step 5 of the design process). For what concerns the *'Geography'* table, the *'Type of site'* attribute in the *'Site info'* sub-table refers to the possibility of having either a *simple* or a *complex* site. In the first case it is suggested to describe the site at hand through a link to the UNESCO Thesaurus [45] for a correct use of the related descriptive terms. In the case of a complex site, this will be described through the list of simple sites which it is composed (Figure A- 6, Annex V).

The *'Risk Management'* tables (Figure A- 8 Annex V) of the CH attribute template are fully dedicated to the risk management aspect and can be further extended by the experts involved in the project.

Following some suggestions on how eventually extend the provided template:

- **Recommended actions versus DRM phases** table: for each of the DRM phase (Prevention, Preparedness, Response, Recovery) it is possible to provide further details.

An example for what concerns the Response phase:

- ✓ **Immediate actions needed**: vegetation clearance, waterproofing, drainage improvement, partial masonry repair, locking gate and fencing, other (specify)
- ✓ **Actions needed**: emergency action needed, in depth condition assessment, mural and decorated surfaces assessment, further research, minor conservation, relocate development proposal, improve previous restoration, no action needed (stable condition), other (specify)
- ✓ **Level of Overall Priority** (to undertake action(s) needed): urgent, high, medium, low
- ✓ **Safety concerns** (danger for visitors): yes, no, if 'yes' please specify
- ✓ **Recommended future monitoring schedule**: every month, every 6 months, every year, after each rainy season, every 2 years, 3-5 years, other (specify)

Mock-up design process: step 5

The last step consists on the integration of the feedback and contributions received by ISRBC (hereby considered as the problem owner). Such contribution has been given with the aim of the mock-up improvement before distribution to the SHELTER Sava OL stakeholders in the form of **release v1.1**.

The main integrations concern the '*General Information*' and the '*Geography'* tables, through the addition of new attributes specific for the '*Heritage type*' and the '*Location*' sub-tables (Figure A- 5, Annex V– ISRBC contribution in red colour) in the former, and the integration of the '*Site info*' attributes with information on the type of complex site and a more specific example from the UNESCO Thesaurus in the latter (Figure A- 6, Annex V - ISRBC contribution in *red* colour).

Moreover the '*Risk Management*' tables have been integrated with further sub-tables concerning the Risk assessment and the Risk manager attributes (Figure A- 8, Annex V - ISRBC contribution in *red* colour).

As explained before, the sections dedicated in the present mock-up to the Risk Management aspects will be further developed in the framework of SHELTER Task 2.5 and Task 2.3. In particular in the latter, the responsible partner (POLITO) will review and eventually extend ISRBC contribution.

The mock-up hereby designed for the CH attributes template in its version 1.1 is the result of the support that WP1 leader, in collaboration with partners selected as expert of the domain, has given to ISRBC, here representing the problem owner, in response to a specific request. The interactions established to this scope have been concluded once the problem owner has provided its feedback on the proposed template.

Figure 41 summarizes the different contributions of the involved partners as collected and organised in the mock-up CH template version 1.1.

Considering that other activities dedicated to the same scope in the context of SHELTER project, with a particular focus on disaster risk, are in progress, further integrations to the present CH attributes template are expected in the near future.

For what concerns the terms and definition that are going to be used to implement the database starting from the current template version, it is recommended to refer to UNESCO Thesaurus [46] and/or ICOMOS [47]. Anyway, a complete review of the terms and labels hereby used will be necessary to be more compliant with the appropriate ontology considerations.

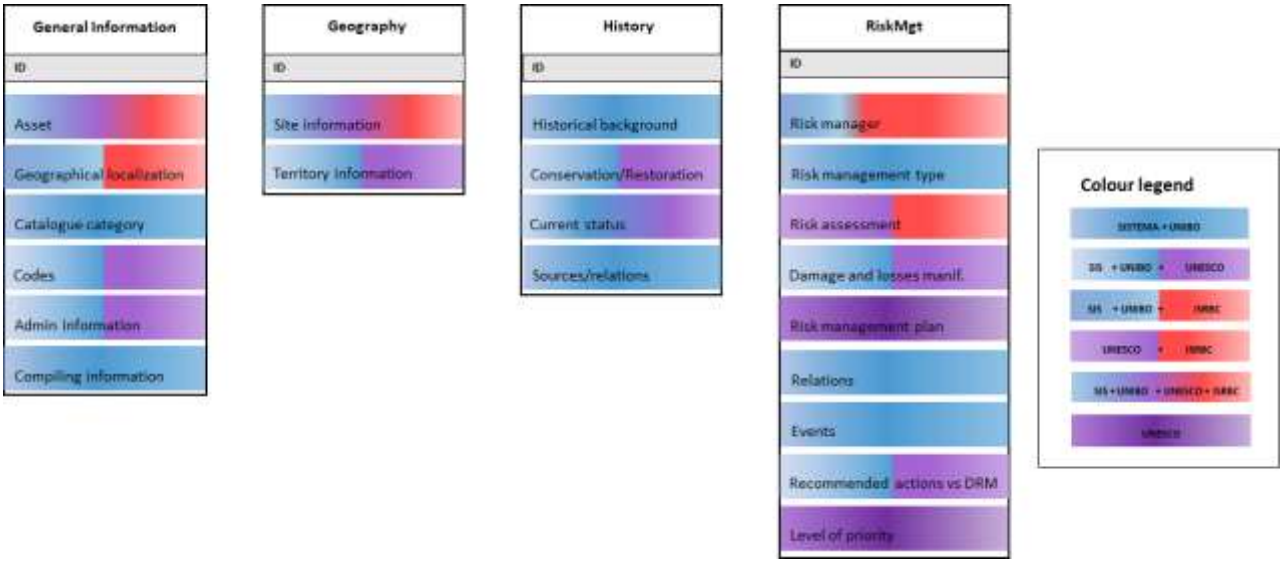

Figure 41: SHELTER partners contributions to the design of the CH attributes template release 1.1 (see colour legend in Annex V)

7 Historical events and social memories in SHELTER Open Labs

7.1 Setting the scene

Understanding the risk is one of the four priorities for action in the Sendai Framework for Disaster Risk Reduction 2015–2030. To achieve this goal in both local/national levels and regional/global levels, a systematic recording of past events is vitally important.

Nevertheless, also gathering relevant historic data (i.e. referring to events occurred in not recent past) on assets under threat is a vital step for learning from past hazards' effects and shaping new scenarios and so "Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction" [1]. For many reasons the same sites had often been affected by several disasters through history. Local history of these territories and urban history of interested cities can be quite helpful to understand their vulnerabilities and resources.

In addition, the built environment as well as social resilience builds and needs to build better on the knowledge and the capability to cope with emergency that buildings, territories and communities experienced in past disasters. It should be noted that this approach has been underlined yet in some specific situation: "Resilience to flood damages can be considered only in places with **past events**, since the main focus is on the experiences encountered during and after the floods" [1].

By this approach, the historical events have to represent a source of existing knowledge that need to be operationalised for the building scope of the SHELTER project in developing its evidence-based approach. However, despite the high value of **historical events memory**, this kind of knowledge remains not easy to gather, since it includes a wide range of heterogeneous information with various grades of impacts and reliability.

Difficulties are mostly due to the lack of a common coherent system to measure and provide precise information at different periods of the past and in different countries.

7.2 Methodology

To this aim, **a protocol to collect information about historical catastrophes and risks** to be shared by considering a temporal framework has been defined. The protocol is aimed at being used by the Open Labs to collect relevant historical information about the SHELTER use cases. The protocol allows to collect data according to common indicators of description and measurement, that are identified as in the Figure 42. These attributes for gathering and organising data for the identification of the disaster have been organized in an excel template (see Annex VI).

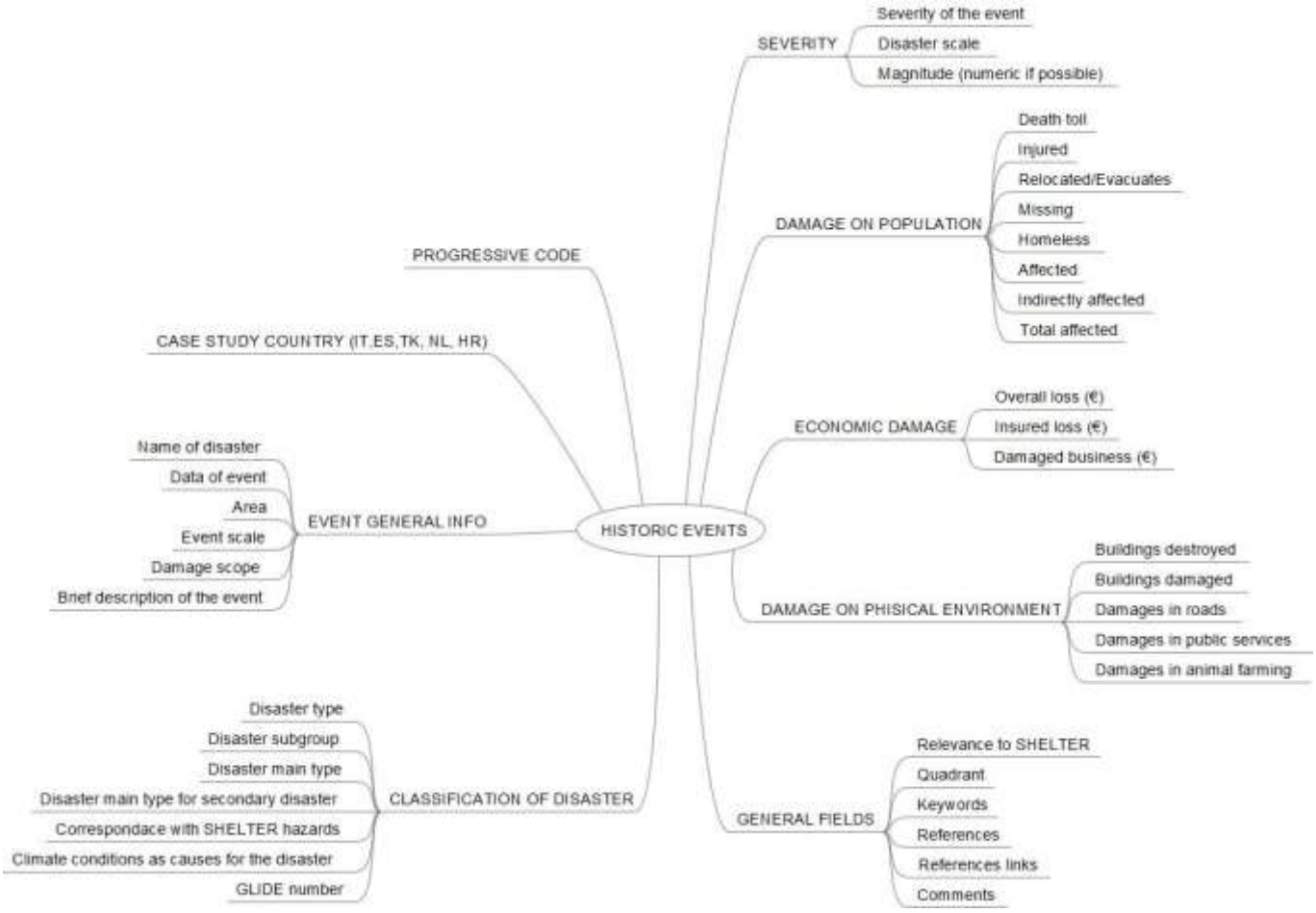

Figure 42: Structure of the "Historic events" data gathering template

The need of a shared framework, language and system of identification is especially important referring to past events. The approaches to disasters have been culturally and scientifically different through the time and the space. Only recently a global vision has been shaped and a common approach have been defined.

The template with the identified attributes aims to create a coherent approach to look to the past in order to collect useful information for the future. However, some pitfalls need to be considered and related gaps to be bridged.

On the one hand, data to be gathered need to be accurate and reliable to be useful for building a baseline. On the other hand, the methodology for collecting data can create some difficulties. The launch of the template in OLs address local stakeholders of the current risk disaster management. They are experts on their specific tasks, but they are not expert in research about the past. They can find some difficulties to find reliable sources and to use a scientific methodology.

Therefore, a desk research has been performed in addition to the contacts with the OLs, to bridge the difficulties mostly shown by Open Labs to reach the achievement of

collecting data in their activities that are more focused on the current situation and latest events occurred. The desk research has consisted in listing existing data sources such as scientific literature and existing databases in different countries that have recorded those past events. The protocol provides the link to the databases. Making interoperable the datasets will be the most useful way to collect information among different systems of measuring, collecting, and identifying the entries.

The task to create a protocol to collect information about historical catastrophes and risks into a temporal dynamic framework is built on existing scientific studies and existing local, national, and international disaster databases that provide information on past disasters in different levels.

Capitalizing on this existing know/how on the disaster registration systems, the methodology developed by POLITO includes a desk research, a questionnaire for OLs, and the definition of a template as protocol for collecting heterogeneous data on risks and disasters. By this approach an accurate bibliographical research and data analysis has been developed.

7.3 Results from literature review

According to literature "the traditional knowledge systems embodied in physical planning and construction, local management systems and ecology, can not only prevent or mitigate the impact of disasters but also provide sufficient coping mechanisms to deal with post-disaster situations. Cultural properties can serve as safe havens for surrounding communities for their temporary relocation during emergencies" [2].

As the first step, a definition of a time framework for the "past" was needed. The desk research ascertained that the possibility to collect information was variable in different places according to local history and development of scientific studies. To define a strict methodology, the time framework has been linked to reliable data sources and nature of data that can be compared. A coherent approach descends. Finally, the "past" that has been taken into account refers to those dates since which data have been collected for each SHELTER area of interest (OLs). Data collected from the databases mostly dates to the 1980s.

A specific aspect concerns the social memory of the past events. The relevance of the local memory for collecting data, in fact, has a diverse meaning and duration. The social memory of historical disasters, in fact, can be strongly relevant for communities. In certain cases, it has become a living memory that inspires the identity of places and cities till nowadays [3].

All events that are out of the ordinary life and management, in fact, play a relevant part in the history of buildings and built environments. They generate changes and influence developments. The social memory of historical events has been recorded, thus, mainly

through art and literature documentation. In some cases, they inspire a rich representation and storytelling. Some archived reports can occasionally provide other ways to testify to social memory. In the modern era (since the 19th century) records of social memories are more common than before, mostly through chronicles, interviews, and images in newspapers and magazines as well private (families') photos.

Disasters, both natural and manmade, are very important in the history of buildings, districts, cities, regions, and even territories. For instance, the urban history of European cities is marked by disasters since the middle ages. Each time a disaster may happen, urban regulations and building codes (in terms of construction techniques, building materials, building heights and volumes) have been redefined [4]. In addition to the urban form, the human response to the disasters form a part of traditions, rituals, habits. Therefore, humanity's relationship with disasters are also a part of intangible cultural heritage. For these reasons, it is important to record this memory in order to understand the impact of disasters on cultural heritage.

Nevertheless, past events have also fostered some adaptations to changes provoked by disasters and to prevent hazards and/or its effects. Specific building acknowledgements have been conceived, rules, and behaviours. This kind of knowledge related to social memory, as informal acquirements, haven't been considered as relevant till now. For this reason, in the case of Past events, a framework for gathering it among existing knowledge of past events doesn't exist for being operationalised for the SHELTER project. For this purpose, this kind of protocol will be created only for the current times, to be used in the Open Lab in the framework of the Local Knowledge (Task 6.5).

Currently, there are a limited number of national and international databases that provide information about historical events; however, most of these databases limit their time frame to the recent history. In the methodology created for the historic events in the SHELTER project, these existing databases are investigated and in addition, historical narratives, visual and audio records are requested from the Open Labs.

The most widely used international historic events database is **EM-DAT** (Emergency Events Database) [5]. EM-DAT was launched in 1988 by the Centre for Research on the Epidemiology of Disasters (CRED) with the initial support of the World Health Organisation (WHO) and the Belgian Government. It compiles essential core data on the occurrence and effects of mass disasters in the world from 1900 to the present day. However, the majority of the registered events are from the 1950s to our day. The database is managed by the Centre for Research on the Epidemiology of Disasters (CRED), drawing from various sources, including UN agencies, non-governmental organizations, insurance companies, research institutes and press agencies. In EM-DAT, data is collected and organized based on these metadata fields: Start Date, End Date, Country Name, ISO, Location, Lattitude, Longitude, Magnitude value (numeric), Magnitude scale ((i.e earthquake: richter, wildfire: km2, Storm: kph, Extremetemp: celcious), Disaster Type, Disaster subtype, Disaster name, Disaster no.

Another international database is the **DesInventar Sendai** [6] is an open-source disaster inventory system which enables countries to manage all the data required for the monitoring of Sendai Framework Targets (a) to (d) which correspond to parallel Sustainable Development Goals (SDG's) indicators from Goals 1, 11 and 13. It allows for the definition and use of Sendai Framework metadata to describe several indicators and allow a finer disaggregation of data. It can be used online or downloaded, but UNDRR (The UN Office for Disaster Risk Reduction, formerly known as UNISDR) has to create an account. Not all the countries are included in the database. Mainly non-US and non-EU. Even though events dating back to the nineteenth century are also listed, the main records are from the second half of the twentieth century. In DesInventar, mainly three datasets are created for each country: (a) Composition of Disaster, (b) Spatial Distribution, (c) Temporal Behavious.

NatCatSERVICE [7] also another international database of historic disaster events. NatCatSERVICE is created by Munich Re (an insurance group) which has already generated a systematic recording scheme all over the world for decades. It has stored these records in a natural hazard archive to be used for risk assessment. This wealth of information is provided online enabling data filtering in several ways. For example, natural catastrophes such as earthquakes and floods can be analysed separately. The historic events in this database go back to 1980. Each event is recorded with the following metadata fields: Date, Event, Affected Area, Overall losses (US$m, original values), Insured losses (US$m, original values), Fatalities (numeric).

Sigma-explorer [8] is another database created mainly for insurance purposes. This is a global natural and man-made disaster database. Events are recorded from 1970 to the present. In the data-base disasters are recorded on an event entry basis and collected information includes dead, missing, injured, and homeless along with detailed accounting of insured and uninsured damages. Each event is recorded with the following metadata fields: Date, Event, Location, Brief description, Losses in USD bn, Insured losses, Victims, Injured, Homeless.

GLobal IDEntifier Number (GLIDE) [9] is a system to assign a disaster number (GLIDE number) for each disaster. This database is able to provide information on the date, duration, location, magnitude, source and a description of disastrous events. This information can be collected on the basis of the GLIDE number, date, disaster type, and country and will include information on human and economic loss. A GLIDE number was issued every week by EM-DAT at CRED for all new disaster events that meet the EM-DAT criteria (see http://www.cred.be) from 2002-2003. And from the beginning of 2004, "Automatic GLIDE Generator" began to generate new GLIDE for all new disaster events. Each event is recorded with the following metadata fields: Event, Number, Country, Location, Date, Time, Duration, Magnitude, Information Source, Comments, Approximate Location (map).

In addition to these international databases, there are also national and regional databases such as European Archive of Historical Earthquake Data (AHEAD) [10], Asian Disaster Reduction Center (ADRC)[11], The Italian Archive of Historical Earthquake Data ASMI (Archivio Storico Macrosismico Italiano)[12], Il Catalogo dei Forti Terremoti in Italia (Catalogue of Strong Italian Earthquakes)[13], The Dartmouth Flood Observatory [14], Australian Disaster Resilience Knowledge Hub [15]. The Protocol is prepared capitalizing on the structure of these existing databases. the structure of the protocol is prepared through a comparative analysis of these databases.

A compared analysis based on existing databases is presented in the Table below.

DATABASE	BRIEF DESCRIPTION	METADATA FIELDS	TIMEFRAME and COUNTRIES	CREATOR – CREATION DATE	SOURCES
EM-DAT: Emergency Events Database [5] **(INTERNATIONAL)**	It compiles essential core data on the occurrence and effects of mass disasters in the world. Collects data from drawing from various sources, including UN agencies, non-governmental organizations, insurance companies, research institutes and press agencies.	Start Date End Date Country Name ISO Location Lattitude Longitude Magnitude value (numeric) Magnitude scale ((i.e earthquake: richter, wildfire: km2, Storm: kph, Extreme temp: celcious) Disaster Type Disaster subtype Disaster name Disaster no.	1900 to present Covers all countries	the Centre for Research on the Epidemiology of Disasters (CRED) in the University of Louvain Created in 1988	Sources include governments, UN agencies (UNEP, OCHA, WFP, and FAO), NGOs (IFRC), research institutions, insurance institutions (Lloyds) and press agencies, although priority is given to UN agencies.
DesInventar Sendai [6] (INTERNATIONAL)	An open-source disaster inventory system which enables countries to manage all the data required for the monitoring of Sendai Framework Targets (a) to (d). which correspond to parallel Sustainable Development Goals (SDG's) indicators from Goals 1, 11 and 13.	Composition of Disasters Spatial Distribution Temporal Behavior (the same set is repeated under each) Event Data Cards Deaths Injured Missing Houses Destroyed	Goes back to 19th century Mainly Latin America	UNDRR (The UN Office for Disaster Risk Reduction, formerly known as UNISDR) Created in 1999	Sources include national insurance agencies, Lloyds, press and media, UN agencies, NGOs, world weather services, clients and subsidiaries. Priority is given to clients and branches, and insurance industry reports.

DATABASE	BRIEF DESCRIPTION	METADATA FIELDS	TIMEFRAME and COUNTRIES	CREATOR – CREATION DATE	SOURCES
		Houses Damaged Indirectly Affected Directly affected Relocated Evacuated Losses $USD Losses $Local Education centers Hospitals Damages in crops Ha. Lost Cattle Damages in roads Mts			
NatCat Service [7] (INTERNATIONAL)	NatCatSERVICE is created by Munich Re (insurance group). Munich Re has been systematically recording loss data from all over the world for decades and has stored them all in a unique natural hazard archive. The database, called the "NatCatSERVICE", provides a wealth of information that can be used for risk assessment.	Data classification (metadata fields): Date Event Affected Area Overall losses (US$m, original values) Insured losses (US$m, original values) Fatalities (numeric)	1980 to present All countries	Munich RE (insurance company) Created in 1974	Sources include national insurance agencies, Lloyds, press and media, UN agencies, NGOs, world weather services, clients and subsidiaries. Priority is given to clients and branches, and insurance industry reports.
The Dartmouth Flood Observatory [14] **(INTERNATIONAL)**	The Dartmouth Flood Observatory (DFO) is a global active archive of large flood events. The observatory uses satellite images to detect, map, measure and analyze extreme flood events on rivers worldwide.	Register # Annual DFO # Glide # Country (click on active links to access current and past inundation extents) Nations Affected Detailed Locations Rivers	1985 to present All countries	The Dartmouth Flood Observatory was founded in 1993 at Dartmouth College, Hanover, NH USA and moved to the University of Colorado, INSTAAR in 2010.	

DATABASE	BRIEF DESCRIPTION	METADATA FIELDS	TIMEFRAME and COUNTRIES	CREATOR – CREATION DATE	SOURCES
		Began Ended Duration in Days Dead Displaced Damage (USD) Main cause Severity * Affected sq km Magnitude (M)** Centroid X Centroid Y Notes and Comments (may include quoted headlines from copyrighted news stories for internal research purposes only)			
Sigma Explorer [8] **(INTERNATIONAL)**	The web application www.sigma-explorer.com contains data from the annual sigma reports on natural catastrophes (catastrophe database) and on the world insurance markets (world insurance database; see institute.swissre.com/sigma). In the case of the catastrophe database, only a subset of the individual catastrophes is shown, ie the twenty largest events for each year by the number of victims, by insured losses or by total losses (excluding events from the US).	Date Event Location Brief description Losses in USD bn Insured losses Victims Injured Homeless	1970 to present All countries except the US	Swiss RE Institute	Sources of information include newspapers, Lloyds, primary insurance and reinsurance periodicals, internal reports, and online databases although no primary source is suggested.

DATABASE	BRIEF DESCRIPTION	METADATA FIELDS	TIMEFRAME and COUNTRIES	CREATOR – CREATION DATE	SOURCES
GLobal IDEntifier Number (GLIDE) [9] (INTERNATIONAL)	A GLobal IDEntifier number (GLIDE) was issued every week by EM-DAT at CRED for all new disaster events that meet the EM-DAT criteria (see http://www.cred.be) from 2002-2003. From the beginning of 2004, Automatic GLIDE Generator" begins to generate new GLIDE for all new disaster events. (GLIDE) is a project initiated and maintained by the Asian Disaster Reduction Center (ADRC) in collaboration with ISDR, CRED, UNDP, IFRC, FAO, World Bank, OFDA/USAID, LA Red, and OCHA/ReliefWeb	Event Number Country Location Date Time Duration Magnitude Information Source Comments Approximate Location (map)	From 2002 All countries	the Centre for Research on the Epidemiology of Disasters (CRED) in the University of Louvain	
GLobal IDEntifier Number (GLIDE) [9] (REGIONAL)	'Sentinel Asia' Project was launched in 2006 in order to establish a disaster risk management system in Asia, using earth satellites. The Asian Disaster Reduction Center receives emergency observation requests from the member countries and other organizations which participate in collaborative projects. 'Disaster Management Support System' is a part of such 'Sentinel Asia' project and offers maps and satellite images, as well as disaster information in the Asia Pacific region from ADRC.	Disaster name Country/ District Date/Period Headline GLIDE Number Related Links（Report/Articles/ Map） Number dead and injured Evacuated Material damages	From 1986 to present 31 member countries in Asia and the Middle East	The Asian Disaster Reduction Center (ADRC)	Sources include UN agencies (OCHA), Reuters and international news agencies (AFP, BBC, CNN), and NGOs (IFRC, Catholic Relief Services).
Australian Disaster Resilience [15] (NATIONAL)	It is a national, open-source platform that supports and informs policy, planning, decision making and contemporary good practice in disaster resilience.	the duration of the event number of people killed injured affected homeless/evacuated economic loss insured loss	1622 to present Australia	managed by the Australian Institute for Disaster Resilience on behalf of the Australian Government	No indication of the primary source

DATABASE	BRIEF DESCRIPTION	METADATA FIELDS	TIMEFRAME and COUNTRIES	CREATOR – CREATION DATE	SOURCES
European Archive of Historical EArthquake Data (AHEAD) [10] (INTERNATIONAL)	AHEAD is a distributed archive aiming at preserving, inventorying and making available, to investigators and other users, data sources on the earthquake history of Europe, such as papers, reports, Macroseismic Data Points (MDPs), parametric catalogues, and so on.	Date Epicentral area NMDP Latitude Longitude Io (Epicentral intensity - MCS scale) Me (Equivalent magnitude based on macroseismic observations)	1000 to 1899 Europe	AHEAD has been maintained and implemented in the frame of the EC project "SHARE" http://www.share-eu.org/ In 2010-2012	UK Historical EarthquakeData base (BGS) SISFRANCE(BRGM, IRSN, EDF) ECOS(SED-ETHZ) ASMI(INGV) Base de Datos macrosísmica(IGN) Base de Dades Macrosísmicade Catalunya (ICGC) Hellenic MacroseismicDatabase (UoA) Macroseismic Data ofSouthern Balkan area (ITSAK) Royal Observatoryof Belgium (ROB) And other onlinemacroseismic archives
Il Catalogo dei Forti Terremoti in Italia (Catalogue of Strong Italian Earthquakes) [13] **(NATIONAL)**	The Catalogo dei Forti Terremoti in Italia, 461 a.C. - 1980 was first published in Italian in 1995 by Boschi et al. (1995: CFTI 1). It was intended as a complete account of Italian "strong earthquakes", of their territorial impact and of the social and economic upheaval caused. The decision of focusing only on the largest earthquakes was dictated by the need to establish a priority among the vast number of events reported in traditional catalogues. Only earthquakes with a reported maximum intensity equal to or bigger than intensity VIII-IX on the MCS scale were considered	Time Io (Epicentral intensity - MCS scale) Imax (Maximum intensity - MCS scale) NMO (Number of Macroseismic Observations) Me (Equivalent magnitude based on macroseismic observations) Latitude Longitude Epicentral Area Notes Review Level	461 B.C. to 1990 Italy	l'Istituto Nazionale di Geofisica (ING; dal 2000 ribattezzato Istituto Nazionale di Geofisica e Vulcanologia, INGV)	the retrieval and formatting of over 23,000 original bibliographic documents, transcribed or printed, nearly 50% of those utilized in the CFTI5Med. These documents are now available on-line as fully searchable pdf files;

DATABASE	BRIEF DESCRIPTION	METADATA FIELDS	TIMEFRAME and COUNTRIES	CREATOR – CREATION DATE	SOURCES
	in the first release of the catalogue, but this threshold was progressively relaxed for its subsequent versions. The second release, that appeared two years later, included more earthquakes, was based on more accurate research, and covered a longer time span (461 B.C. to 1990) (Boschi et al., 1997: CFTI 2).	(Bibliographic references for each earthquake are also provided)			
The Italian Archive of Historical Earthquake Data ASMI (Archivio Storico Macrosismico Italiano) [12] (NATIONAL)	It provides access to data on more than 5000 Italian earthquakes deriving from more than 300 seismological studies. For each earthquake, different kinds of studies are accessible, giving a wide perspective on the multiplicity of the available information.	Catalogue Latitude Longitude Io (Epicentral intensity - MCS scale) reference	461 BC to 2014 Italy	The Italian Civil Protection Department and Istituto Nazionale di Geofisica e Vulcanologia.	(It uses the database of CFTI (catalogue of strong Italian Earthquakes).

Table 12: Compared analysis of existing databases

The most relevant contributions on the matter of disaster observation and managing is the publication *Managing Disaster Risks for World Heritage* [2]. This joint publication of UNESCO, ICCROM, ICOMOS, and IUCN has provided the main theoretical and scientific framework. Moreover, one of the required information sets that are needed for identifying disaster risks to cultural heritage is defined as "information on the history of different disasters affecting the area or the property itself, obtained from historical records and from specific agencies dealing with different types of disaster" [2]. Some specific insights in the literature review are that historic events are an integral part of understanding the existing risks to cultural heritage. Moreover, data on past events are guiding to develop policies and strategies to mitigate the risk and it is vital also in the post-disaster recovery processes. However, it should also be noted that 'learning from disasters' is a very challenging and complex task because on the one hand it is a political act that requires the empowerment of technical expertise, on the other hand it requires a risk-taking process in which it is needed to observe the values of society [16].

To define the time frame of the "past events", POLITO, as responsible for this methodology, analysed different kinds of possible data sources in order to check the available information. Only a few historical events have been systematically or

specifically analysed. It's the case of some Italian studies that have especially considered disasters among important events in the past and a methodological key for historical research [17]. Disasters, in fact, are part of extraordinary events that create strategic variables in the way cities and territories grew up, developed, changed and were renovated. Nevertheless, by this approach, events include all situations that are out of the ordinary, both negative and unexpected environmental occurrence and positive and planned organised happening. Consequently, the current literature is interested in aspects that usually don't focus specifically on the description of the disaster effects or especially analyses specific case study [4].

The databases of the Conservation Information Network (the Getty Trust) has been developed as A Brief Bibliography On Disasters [18]. This bibliography takes into account different kinds of Past Events happened in sites and/or cultural heritage institutions (i.e. damages for fire, flood or earthquake to collections) and related recovery measures. Many studies have been devoted to relevant museums and archives damaged by well-known catastrophic event (i.e. flood in Florence and the rescue of books or art masterpieces) or well-known cities under risk (i.e. Venice). But it seems there is a lack of a similar approach to the built environment, especially devoted to less known sites.

As a second step, the desk research has focused on identifying the main data sources including information in different countries and more specifically including the interesting areas of OLs. For this regard, in particular, the methodology for Past Events data collecting capitalizes on the existing local/national/global risk databases mentioned above as well as the existing knowledge of the Open Labs. After an investigation of national and international databases, a comprehensive framework of the protocol has been created. This new protocol has been conceived to create a registration scheme for historic and recent disaster events by identifying the attributes for a comparative collection and analyse. The attributes allow defining an identification key through a research form.

The databases that have been analysed with their attributes, and data of which have been included are: EM-DAT: Emergency Events Database, DesInventar Sendai, NatCat Service, The Dartmouth Flood Observatory, Sigma Explorer, GLobal IDEntifier Number (GLIDE), Australian Disaster Resilience Knowledge Hub, European Archive of Historical EArthquake Data (AHEAD), Il Catalogo dei Forti Terremoti in Italia (Catalogue of Strong Italian Earthquakes), The Italian Archive of Historical Earthquake Data ASMI (Archivio Storico Macrosismico Italiano). The identified databases have been shaped by different institutions, in different years, by considering different scales, to collect different kinds of data. Their models come from different approaches and disasters experiences and scientific studies. A comparative analysis of these databases is provided in the table above that gives information about its main objective and scope, year of creation, institution creating, kind of data collected, measure system, interesting area. Existing datasets provide, thus, a heterogeneous information that needs to be included into a

new research form in order to create a comparable system of data, and the baseline for the new information and approaches according to SHELTER project methodology and contents.

In this aim, diverse systems of description and measurement (also at different times) have been analysed and addressed to be integrated and made in dialogue. By doing so, the proposed methodology goes beyond a simple list of past events and it registers these disaster events with the impact they caused together with the related social memories.

As a part of the methodology, the protocol has also been tested to understand if it properly functions and enables data collection. For instance, for the Ravenna Open Lab, in addition to the EMDAT and GLIDE databases, Istituto Nazionale di Geofisica e Vulcanologia (INGV), Archivio Storico Macrosismico Italiano, and il Catalogo dei Forti Terremoti in Italia (461 a.C.-1997) e nell'area Mediterranea (760 a.C.-1500) were investigated and already existing registries are transferred to the protocol. For the Seferihisar Open Lab, in addition to the EMDAT, Google Scholar database is investigated and two historic events (one from 1867, and another from 1944) are registered in the protocol [19].

For the Sava River Open Lab [20], the existing Sava GIS Portal has been investigated. For this, a user account is requested from the Sava River through the technical partner (UNESCO) and an online meeting was organized with the administrator of the GIS Portal in order to discuss how to make use of the existing Sava Portal historic data in the most useful and efficient way. In addition, SAVA GIS Data Policy document [21] (provided for POLITO by the Sava River and UNESCO) has been used to understand the structure of the Sava GIS Portal. Discovering that SAVA GIS Portal uses data from the European Floods Database of the European Environment Agency [22], it became possible to integrate data from two datasets in the protocol. Moreover, a limited number of historic events listed in the Sava River Flood Risk Management Plan [23] were added to the protocol. This way, a total number of 604 events has been registered in the protocol for the Sava River Basin.

According to this approach, the attributes of the template have been defined in order that the Open Labs could be requested to provide also historical visual, audial, written documents in addition to compiling the protocol. This process of communicating with the Open Labs for requesting information was managed by the Work Package leader.

Since existing databases already provide some essential information regarding past disaster events occurred in the sites of each Open Labs, it is vitally important that this data is made interoperable. Therefore, **interoperability** of the existing databases with the SHELTER Historic Events protocol is at the core of the methodology. This approach will be moved to a further step with the Task 2.3. 'Anatomy of Historic Areas: collective characterisation of CH assets' in which the "historic events information for linking cultural heritage assets to their intangible (narratives and visual sources) will be included".

Therefore, as mentioned earlier, it is vitally important that the protocol creates a comprehensive, consistent, innovative and interoperable framework which can collect and organize both existing past disaster knowledge and related social memories.

In order to be able to collect data from the Open Labs, a simpler version of the framework is requested from Open Labs through technical partners with the communication of the WP 1 Leader (SIST).

Within this framework, it becomes possible to operationalize the already existing data making use of databases, to collect data directly from the Open Labs, and to integrate documentation regarding the social memory (chronicles, interviews, and images in newspapers and magazines as well private (families' photos, videos, artworks related to the disaster, etc.).

7.4 The SHELTER protocol to collect historical events and social memories

The SHELTER protocol to collect historical events and social memories is organized through a comprehensive attributes table in an excel sheet. This format has been decided collectively with the task leader and the work package leader. Moreover, the WP5 leader (LINKS) is also consulted for possible insertion of the protocol's dataset with the Data Lake (Task 1.3). Following the WP5 leader's feedback, the below attributes are defined for the registration of each past disaster event.

As mentioned above, regarding the requests from the Open Labs, a general strategy is adapted by SHELTER to collect specific requests about selected information from the Open Labs. Following this strategy, the work package leader communicated the following template with the Open Labs through technical partners. After receiving the templates, the complete protocol (which is structured in the format of an excel sheet and presented in Annex VI) is completed by either technical partners or POLITO. So far, only four out of five Open Labs have managed to start filling in the template. This information collection form is presented in the next section.

Data Field	Explanation for the data field
Progressive Code	It is a cross-cutting characteristics as described in Section 3. The code indicating the compiler and the entry number. i.e. POLITO_c_001.
Country Code	The country code of the disaster event.
IDENTIFICATION OF DISASTER	
Name of Disaster	Indicate If the disaster has a specific name (i.e. Hurricane Katrina) given by the site/under which is known.
Date of Event	YEAR/MONTH/DAY. If the date and/or month is not clear, enter: YEAR/00/00.

Start time of the event	Start time of the event according to GMT +2 time zone.
End time of the event	End time of the event according to GMT +2 time zone.
Area	Indicate the areas affected from the disaster.
Longitude	X coordinate of the center area of the event.
Latitude	Y coordinate of the event.
Event scale	It is a cross-cutting characteristics as described in Section 3. If 'multi-scale', please specify which ones among those mentioned beside.
Damage scope	If 'multi-scope', please specify which ones among those mentioned beside.
eucd_pfra (for Sava River Basin)	EU Flood Event Code (used in Sava River). This code corresponds to FloodLocationCode in the European Past Events Database of the European Environment Agency.
Brief Description	Briefly describe the disaster. Please avoid long descriptions and try to describe the main event. If you want to provide more information, use the 'NOTES' tab.
CLASSIFICATION OF DISASTER	
Disaster Type	Select a disaster main type according to https://www.emdat.be/classification.
Disaster Group	Select one of four disaster groups (Geophysical Events, Meteorological Events, Hydrological Events, Climatological Events) defined in the SHELTER Project.
Disaster Main Type	-Geophysical (earthquake, subsidence) - Meteorological (storm, heatwave) - Climatological (wildfire) - Hydrological (flooding)
Disaster Main Type for Secondary Disaster	If the disaster caused a secondary disaster (i.e. an earthquake caused a flood), indicate the main type of the secondary disaster according to classification above.
Correspondence with SHELTER hazards	It is a cross-cutting characteristics as described in Section 3.
If 'multi-hazard', or 'other hazards'	If 'multi-hazard' have been selected from the list above, specify which ones. If 'other hazards', please add the description of the other hazards addressed.
climate/ atrophic conditions as causes for the disaster /or VULNERABILITY	Specify conditions that may affect the vulnerability to a disaster or the disaster event.
GLIDE Number	GLIDE number of the disaster taken from the GLIDE Database (if possible).
SEVERITY OF DISASTER	
Severity	Select the severity of disaster as soft, medium, intense, severe.

Disaster Scale	Indicate which unit is used to measure the disaster. I.e. Richter; wildfire: km2; Storm: kph; Extremetemp: Celsius.
Magnitude	Enter the numeric value that indicates the scale of the disaster.
DAMAGE ON POPULATION	
Total Death	Indicate the number of people who lost their lives due to the disaster.
Injured	Indicate the number of people who got injured due to the disaster.
Relocated / Evacuated	Indicate the number of people relocated or evacuated due to the disaster.
Missing	Indicate the number of people whowent missing due to the disaster.
Homeless	Indicate the number of people who lost their houses due to the disaster.
Affected	Indicate the number of inhabitants of the disaster area who got affected due to the disaster.
Indirectly Affected	Indicate the number of inhabitants of the region who got affected due to the disaster.
Total Affected	Indicate the number of people who got affected due to the disaster.
ECONOMIC DAMAGE	
Overall Loss (€)	Indicate the total economic loss that the disaster caused.
Damaged Businesses	Provide a list of businesses damaged due to the disaster.
DAMAGE ON PHYSICAL ENVIRONMENT	
Buildings Destroyed	Indicate the number of buildings destroyed due to the disaster. If possible, provide a list of buildings.
Buildings Damaged	Indicate the number of buildings damaged due to the disaster. If possible, provide a list of buildings, and specify if they are in use after the disaster or not.
Damages in Roads	Describe the damage on roads (i.e. the highway between Location A and Location B became destructed). If possible, provide a numeric value in km or m.
Damages in public services (schools, hospitals, etc.)	Number of public service buildings damaged due to the disaster. If possible, provide a list of services.
Damages in agricultural product fields	Number of agricultural production fields (in ha) damaged due to the disaster. If possible, provide a list of agricultural production fields.
Damages in industrial areas	Number of industrial areas (in ha) damaged due to the disaster. If possible, provide a list of industrial fields.
Damages in animal farming (cattle)	Number of animal farming areas (in ha) damaged due to the disaster. If possible, provide a list of animal farming areas.
GENERAL FIELDS	

Relevance to SHELTER	It is a cross-cutting characteristics as described in Section 3.
Quadrant*	It is a cross-cutting characteristics as described in Section 3.
Keywords	It is a cross-cutting characteristics as described in Section 3.
References	Newspapers, journals, catalogue, etc.
References (links)	Hyperlink to the references whenever possible.
Comments	Additional comments can be added here.

Table 13: Protocol to collect historical events and social memories

7.5 Results from SHELTER Open Labs

7.5.1 Ravenna Open Lab – graphical representation of the results

The completed protocol (excel) filled by POLITO and UNIBO is presented in Annex VI. In total, 23 events have been included in the protocol. The events cover a wide time span from the 5th century to 2019. The collected information concerns earthquake and flood events. Information about the damage on population, economic damage, and damage on the physical environment are very limited, nevertheless, brief description for each event is provided, and the primary source of information is also provided.

Figure 43 shows that 48% of events refers to a city level and, in particular, they refer to the city of Ravenna where the Open Lab took place. 18% of events deals with a specific building that is the Church of Santa Croce (i.e. the focus of the Ravenna Open Lab) and 17% of them refers to Emilia Romagna region.

In Figure 44 it is also possible to see that the main hazards occurred in Ravenna and in its region are Earthquakes (which represent 57% of results) and floods (which are 30% of the total). When an event concerns more than one hazard, they all have to do with floods and subsidence (numerically they are 3 events out of 23).

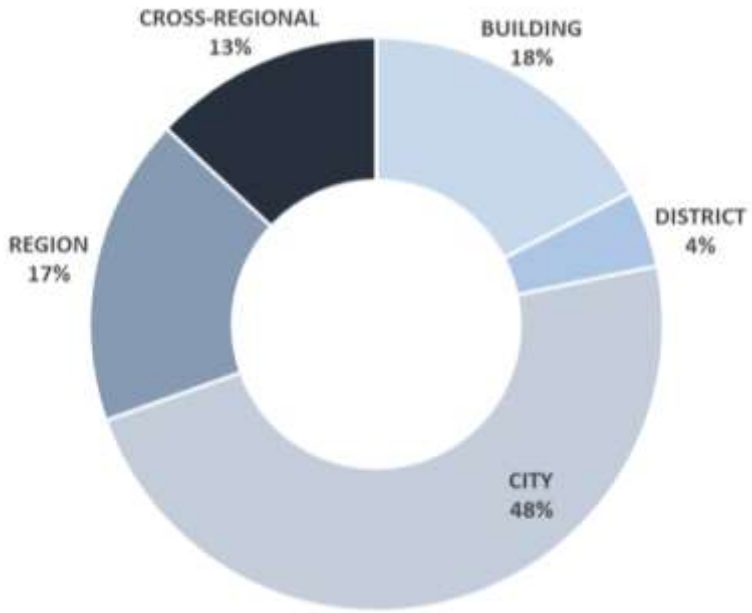

Figure 43: Ravenna OL events' spatial scale from.

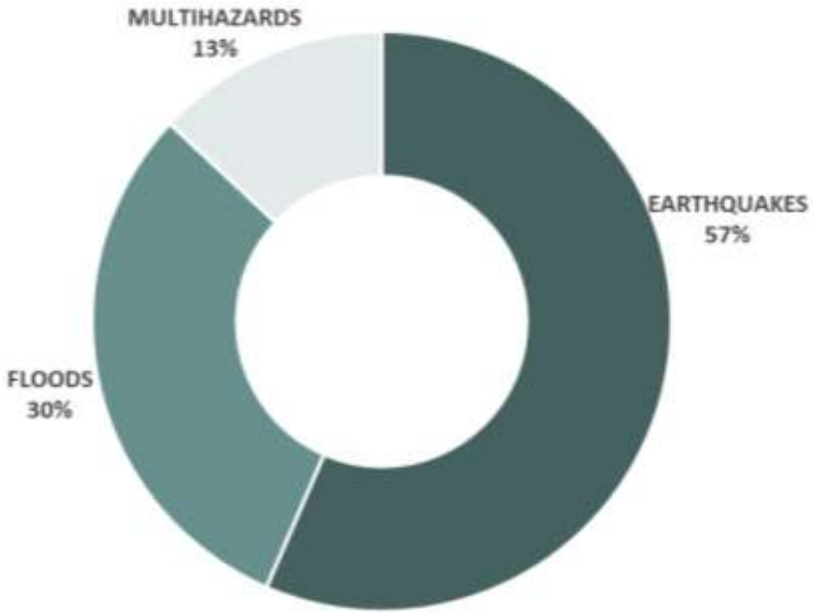

Figure 44: Hazards addressed by the Ravenna OL events.

When it comes to events' contents, Figure 45 shows that the 70% of them are multi-scope and the 26% has a social dimension. In case of multi-scope events, about the 80% of them is characterised by environmental and cultural features, as shown in Figure 46.

Lastly, Figure 47 specifies that the 78% of events is framed in the QB quadrant which means that the events deal with a specific hazards and a urban/territorial scale; in addition, the other 22% of events concerns specific hazards and building/district scale.

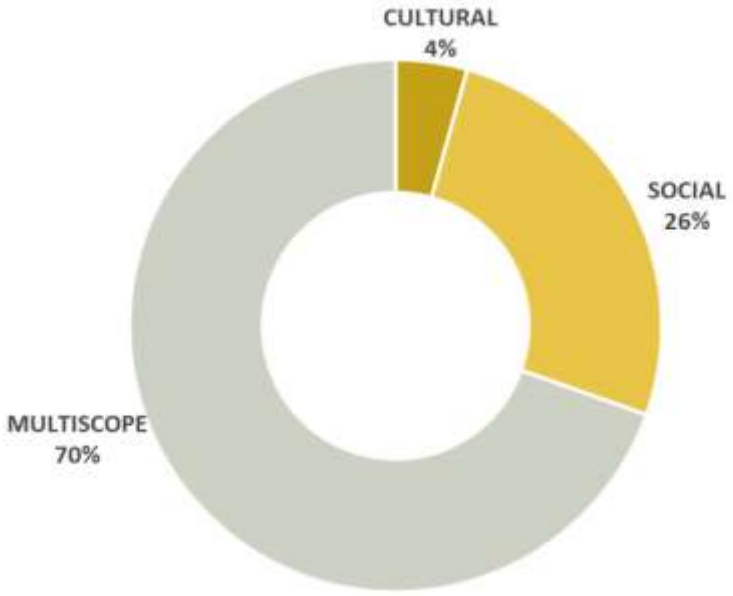

Figure 45: Resilience dimensions that Ravenna OL events refer to.

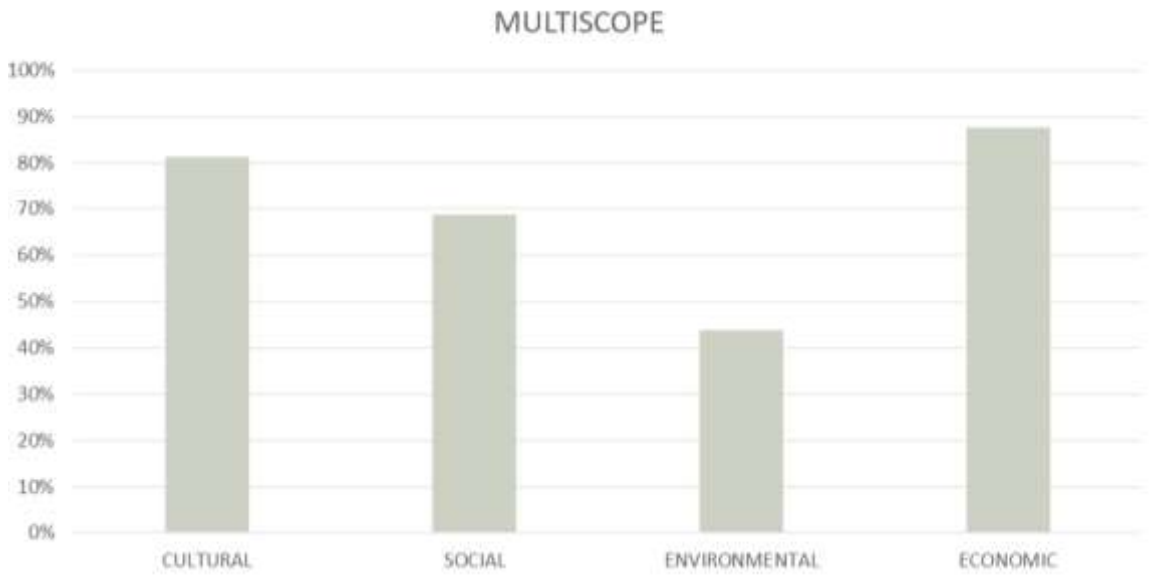

Figure 46: Specification of multi-scope's composition

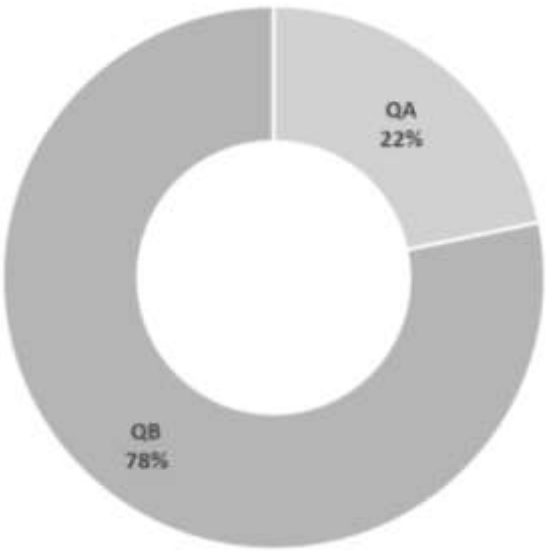

Figure 47: Ravenna OL events' resilience conceptual framework distribution.

7.5.2 Seferihisar

In the timeframe available for the collection of data on historical events within deliverable 1.2 it was not possible to retrieve data on historical events for this OL, mainly due to a change in the reference person coupled with the Covid-19 pandemic. However, the research and collection of this data will be continued in the coming months during the workshops scheduled every six months thanks to the interaction with stakeholders. At the moment, the lack of information has been made up for by collecting data from the data set compiled so far and from other projects, such as the World Bank project [24], which focuses on Seferihisar.

7.5.3 Dordrecht

The information received from the Dordrecht Open Lab via email is presented in Annex VI. In total, 6 events are registered. (This information still needs to be reflected to the protocol). The events date from 1421 to 2020 concerning floods and storms. The documentation (journal articles) are also provided. Therefore, regarding the social memory, Dordrecht Open Lab has provided more materials compared to the other Open Labs.

7.5.4 Galicia

The information received from the Galicia Open Lab via email is presented in Annex VI. The desk research for this open lab is still continuing.

7.5.5 Sava River

The completed protocol (excel) information received from the Sava River Open Lab via email is presented in Annex VI. Through a research on existing databases, 604 events were registered in the protocol. Data is collected from the EU floods database by POLITO. Also, the data on Sava River GIS is downloaded and integrated.

7.6 Gaps detected and next steps

With the inputs received from Open Labs (as stressed above, the communication with Open Labs was managed by the WP leader through Open Lab Coordinators), it is become evident that the existing data, which is stored in the above-mentioned local, national, regional, and international databases has to be made interoperable with the protocol. In fact, since the methodology of the task has created a knowledge baseline with this protocol based on existing disaster data registration schemes of existing databases, it will not be very difficult to use this baseline to integrate what is already existing. Therefore, the next step is to control and to study above-mentioned databases to operationalize the protocol. This way, it will be possible to create a coherent structure regarding the diverse nature of each open lab in terms of scale, hazards, management, etc.

Another detected gap is related to the amount of visual, written, audial documentation related to the documentation of social memory. The amount of information obtained from Open Labs regarding the social memory is not sufficient to generate a coherent and well-balanced narrative regarding each open lab.

8 Conclusions and next steps

The main objective of this deliverable has been to provide codification of existing knowledge by identifying a methodology that has been applied to different knowledge elements to described, filtered and assessed already available knowledge to benefit from.

The best and next practices observatory has been conceived as a repository of information on SHELTER related topics such as DRM, CCA, CHM. Existing ontologies, local knowledge and historical events, best practices and tools have been identified and analysed. For each of them, gaps have been detected, and next steps have been drafted.

A cross-cutting analysis based on the common key elements presented in Section 3 has been developed to provide a general overview on the results in terms of common characteristics of best/next practices, tools, events and regulatory frameworks.

Figure 48 shows that multi-scale feature distinguishes 40% of results, which represents the majority, followed by the cross-regional scale which represents 23% of total. It is relevant to notice that the country scale belongs only to the regulatory framework sphere and it is not present in the other ones. Figure 49 highlights that the city scale is the prevalent among others, if the multi-scale composition is further specified.

When it comes to the addressed hazards considered by the entire research of task 1.2, the most prevalent are multi-hazards and non-specific hazard; in any case, also this last category represents more than one hazards. It can be seen in Figure 50, and the composition of multi-hazards is further specified in Figure 51.

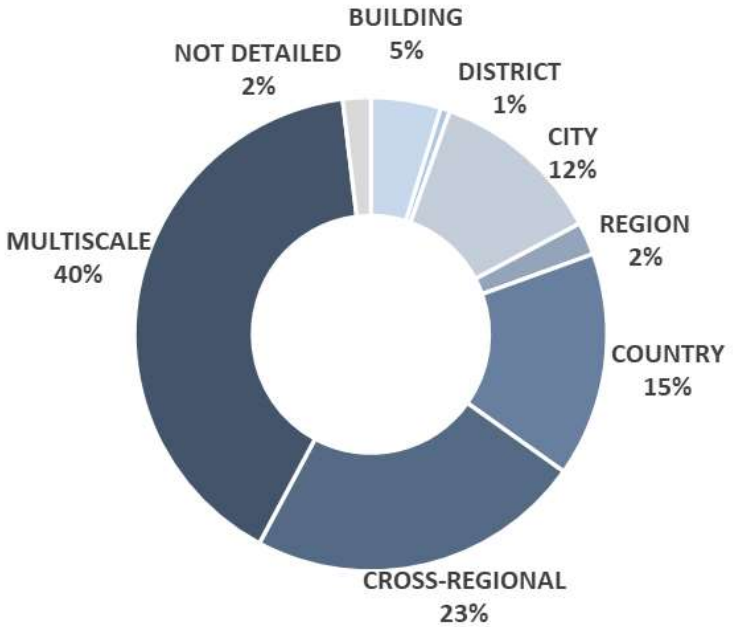

Figure 48: The spatial scale addressed in bibliography

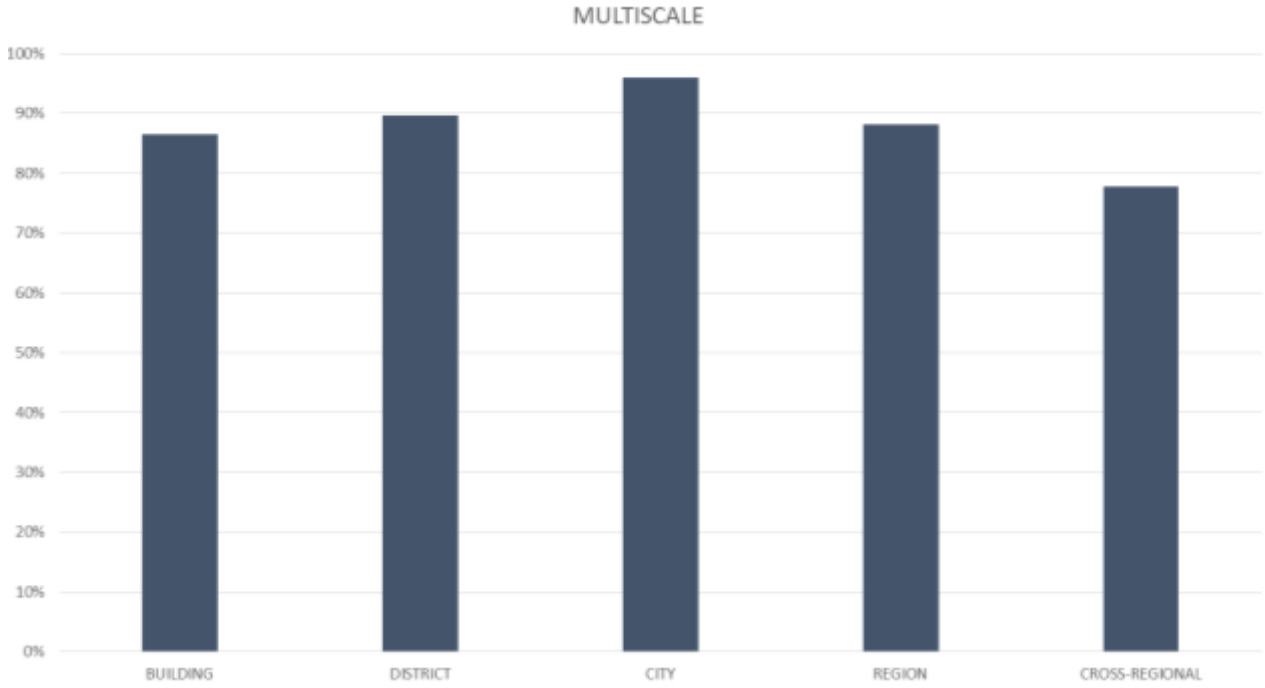

Figure 49: Specification of multi-scale characteristic

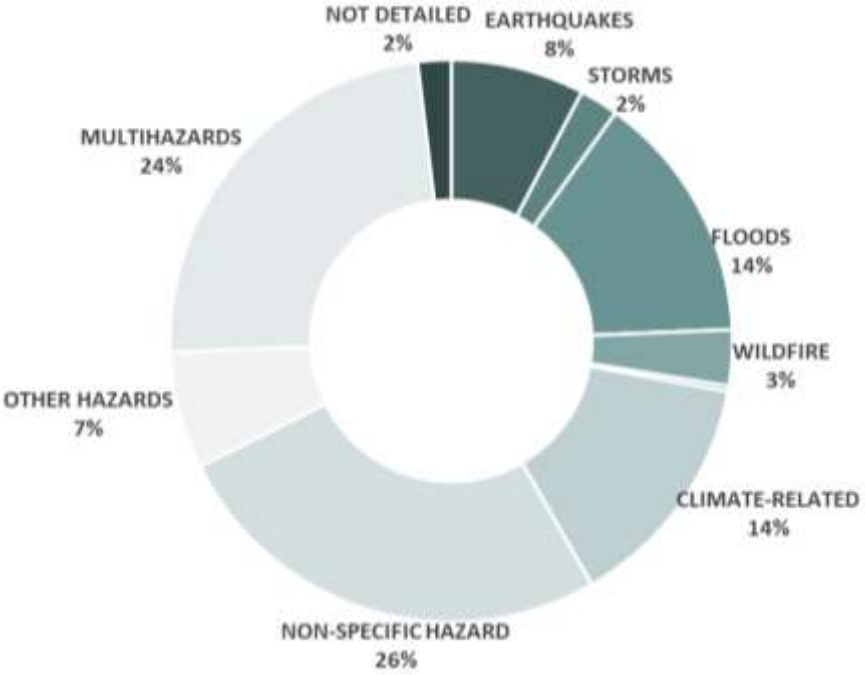

Figure 50: Hazards addressed in bibliography

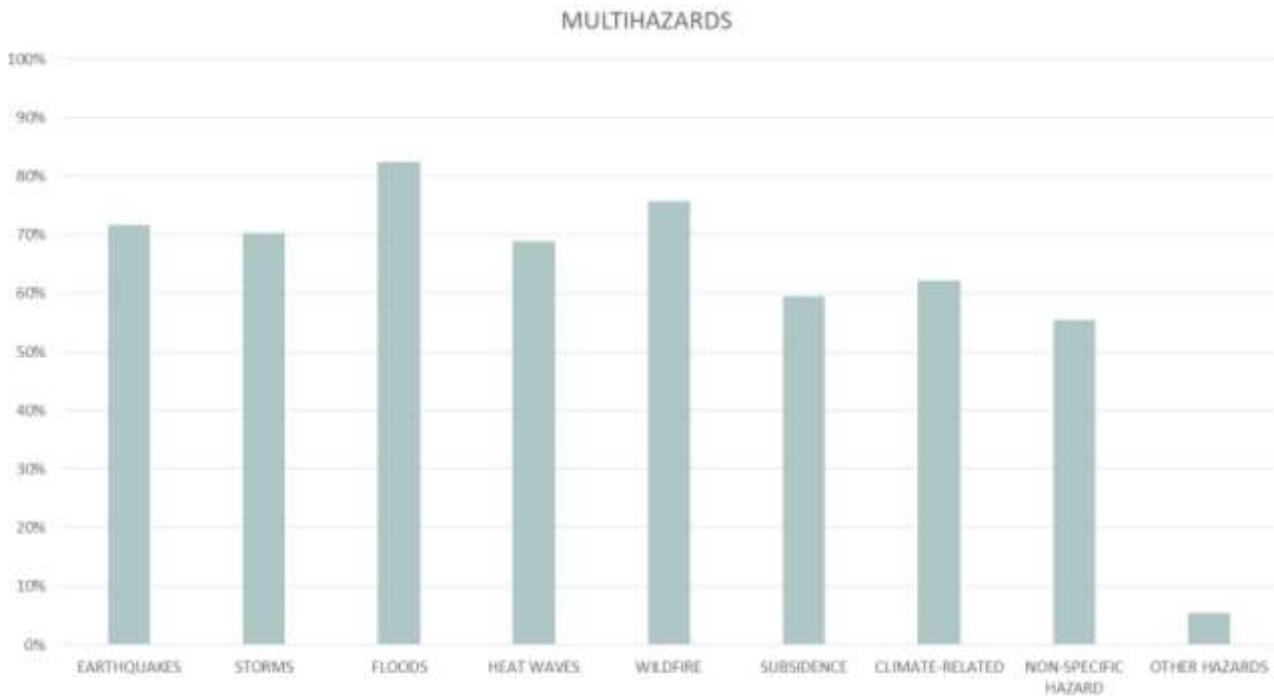

Figure 51: Specification of multi-hazard characteristics

For what concerns the general scope of the research, 75% of items is multi-scope as it can be seen in Figure 52. In Figure 53 is shown that all the scopes' dimensions are present in a similar way.

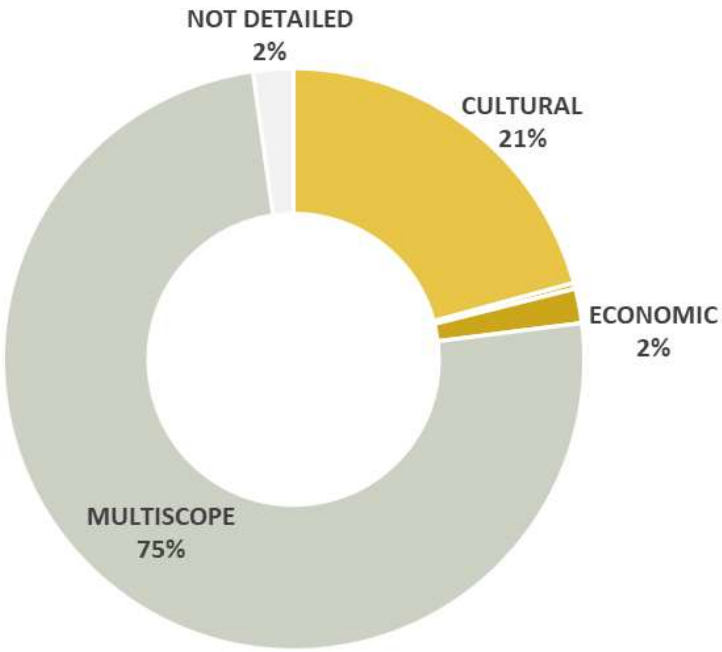

Figure 52: Resilience dimensions of the research in bibliography

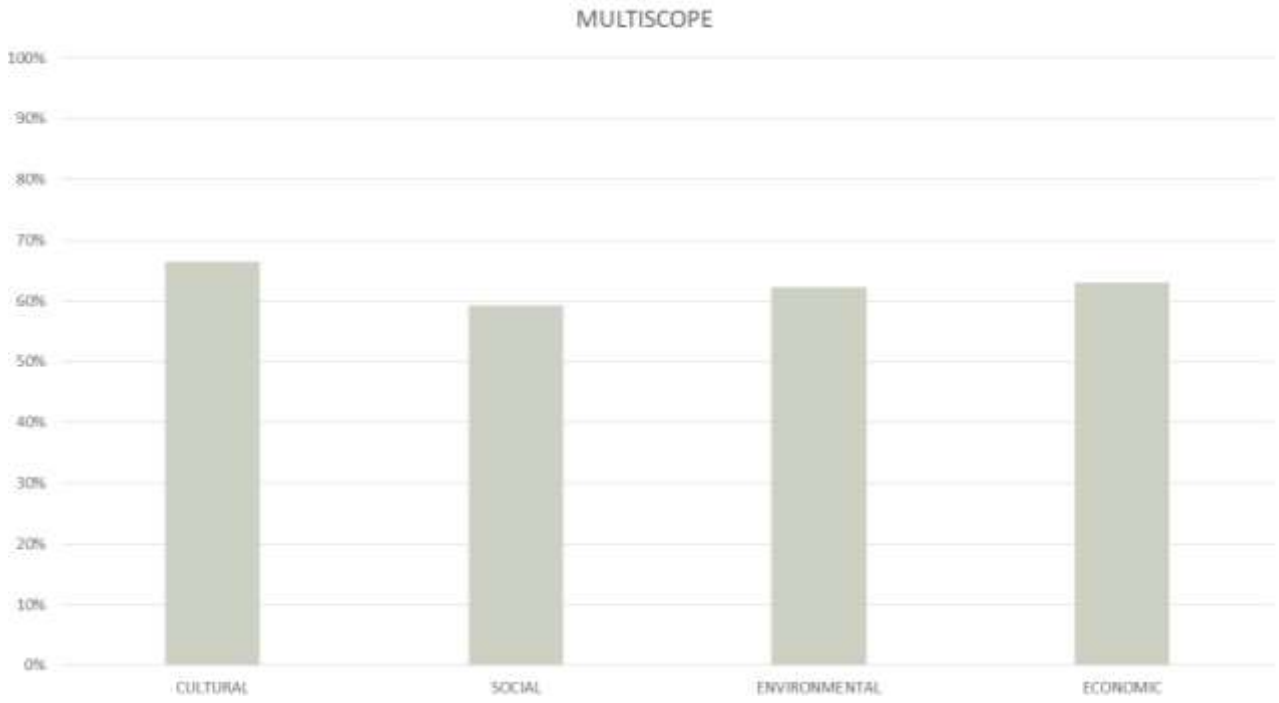

Figure 53: Specification of multi-scope characteristics

For what concerns the relevance of the task to SHELTER project, Figure 54 shows that 44% of items has a high relevance and only 12% has a low relevance. Figure 55 shows that the results are basically equally distributed in the four defined quadrants, that is QA with 19% of results, QB with 32%, QC with 23% and QD with 24%.

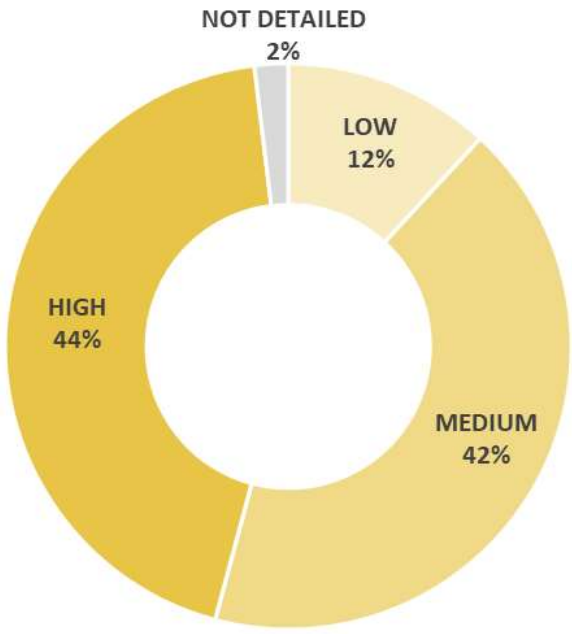

Figure 54.: Relevance to SHELTER project

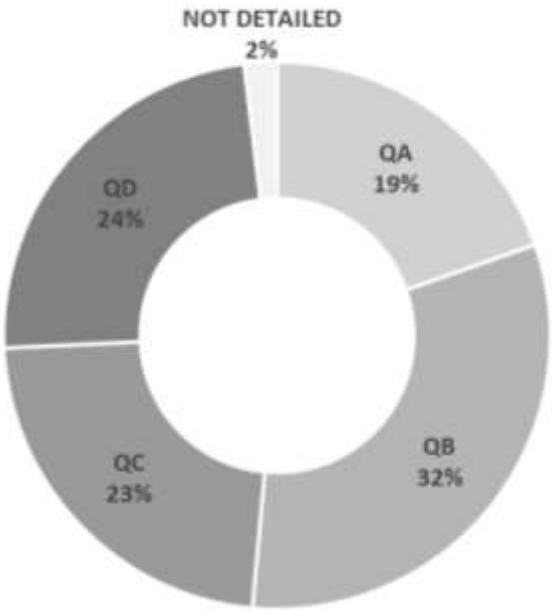

Figure 55: SHELTER resilience conceptual framework addressed in bibliography

The literature review of existing **ontologies** performed in **Section 4** has constituted the main foundation towards the definition of a base ontology for SHELTER project and the core vocabulary that will evolve with the needs of the project. The ontology has been aimed at informing and facilitating other activities in the project. The SHELTER core vocabulary is made by 65 definitions, which have been also included in the SHELTER Wiki, a webpage to further disseminate the core vocabulary with the OLs and beyond the consortium.

The desktop analysis performed in **Section 5** provides a relevant overview of the landscape of available documents that address DRM for the CH sector (DRR, emergency preparedness and response and post-disaster reconstruction phases).

The documents reviewed at **International level** highlight the increasing importance given by international organizations concerned with CH to the need to implement adequate DRM procedures. Moreover, there has also been a growing emphasis about the importance and the need to integrate CH risk management and into general (multi-sectorial) risk management programmes and policies at the national and regional levels.

The documents reviewed at **European level** highlight the increasing importance given to CH by high-level EU institutions. Still, even though reference to specific issues related to the need to implement adequate DRM procedures for the CH sector have been made by several frameworks, work plans, action plans or studies, the practical consequences of those documents have been minor and mostly in the form of recommendations for Member States. Since existing documents are mostly not in the form of policies or

legislation that list measures that need to be enforced, Member States are free to implement these recommendations as they see fit. Nevertheless, it should be noted that the documents that were reviewed clearly identify what needs to be implemented to achieve robust practices towards reducing disaster risks in CH in Europe.

The documents reviewed at **National** level highlight how the different countries present very different levels of development on matters related to DRM of CH. A higher level of development is often seen in countries that suffered recent disasters that affected CH (e.g. Italy or Albania), thus making them more aware of the importance of developing adequate DRM policies, guidelines or procedures for this sector. This reactive nature is also responsible for the fact that a significant amount of measures developed after disasters address specifically disaster preparedness and response. Hence, except for a few cases mostly focussed on earthquake as hazard, there is a lack of adequate risk assessment tools and procedures dedicated to CH across countries and dedicated to other hazards. Some of the countries that were analysed have developed guidelines and legislation that can be applied to support the implementation of DRR practices for certain hazards.

The **Good Practice** review in **Section 6** contributes, along with the other observatories conducted in the Task, at setting the scene of the current operational knowledge framework for Natural and Cultural Heritage resilience. When looking at the practice collection, two main conclusions can be drawn.

First of all, it has become increasingly recognized that cities should not only focus on preventing disastrous events, but most importantly recognize them and be ready for them. Traditionally the main focus was on how to divert risks from urban areas, but this did not solve the problem that, on contrary, has become stronger and more frequent in recent years. At the same time, event when the event was kept away from people, the solution did not always prove totally effective and economically efficient. Therefore, it has been acknowledged that the correct question is how to be ready for the event, even in urban areas, what measures to take to mitigate its effects in urban areas, what strategies to adopt to reduce both effects and consequences. It is sure that there is no unique answer to this question, but the correct generic reaction is for the authorities to adopt a mix of strategies addressed to all the DRM phases.

Secondly, consequently to the first conclusion, the review highlights that there has been a change of approach in recent years in the fight against climate change. In fact, among the case studies analysed not necessarily the cities that had advanced technologies at their disposal were the ones that responded best to the risks they were exposed to. It became more and more evident that it was not the availability of technology that made them ready for an event, but above all the methodology with which they were used and by whom. This led to progressively shift the attention towards stakeholders, authorities, governments, increasingly focusing on their readiness to react and even more on their level of cooperation. Technologies are certainly a great contribution to urban resilience,

but the real challenge is now the to bring new actors on the DRM scene and to educate new and old ones to use the capabilities they already have at disposal.

The engagement and cooperation of community, private and public sectors, the establishment of targeted procedures, policies and funds, the inclusion of adaptive strategies into governance long term planning have been reckoned the key factors to ensure a good level of preparedness and resilience against climate change related hazards.

The experimentation of a mock-up for cultural heritage attributes template has been a successful experience to demonstrate to what extent the existing knowledge can be turned into **next practices**. Sava River Basin OL has been used as a case study and the mock-up developed is considered to contribute to the Anatomy of Historic Areas to be developed in Task 2.3.

Historical events are an important source of existing knowledge that need to be operationalised. Despite the high value of **historical events memory**, this kind of knowledge remains not easy to gather, since it includes a wide range of heterogeneous information with various grades of impacts and reliability.

A **protocol** to collect information about historical catastrophes and risks into a template to be shared by considering a temporal framework has been defined in Section 7. Since existing databases already provide some essential information regarding past disaster events occurred in the sites of each Open Labs, special attention has been put to the interoperability of the existing databases with the SHELTER Historic Events protocol.

The protocol has been validated by the Ravenna Open Lab, while the other OLs have been started collecting and operationalising the sources of knowledge available at local level, and they will continue using the protocol tool during the project duration.

Concluding, the report has contributed not only to present the knowledge reviewed and collected, but also the demonstrate how the available existing knowledge can be gathered and operationalised by using protocols and tools that will be further exploited during the next coming OLs activities.

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10 Annexes

Annex I – Regulatory framework data collection sheet

Annex II – Good practices data collection sheet

Annex III – Tools data collection sheet

Annex IV – Reference numbers and progressive codes for the reference framework, good practices and tools data gathering sheets

Annex V – Next practices: Cultural Heritage attribute database for Sava River Basin Open Lab

Annex VI – Historical events data collection sheet

10.1 Annex I – Regulatory framework data collection sheet

Table A - Regulatory framework data collection sheet. Complete Excel file available here.

		REGULATION GENERAL INFO											REGULATION CONTENTS								REGULATION REPLICABILITY		GENERAL FIELDS				
PROGRESSIVE CODE	Case study Country (IT, ES, TK, NL, AL, UK, CH, GR, PT) or European or International level	name of the document	type of document (policy, framework, regulation, strategy, manual, guideline, resolution, methodology, protocol, study, report, etc.)	Legally-binding document?	Topic of the document (i.e. DRM, DRM-CCA, disaster preparedness and emergency response; post disaster reconstraction and recovery)	promoter(s)	Document scale*	Document scope*	If "multiscope", please specifcy which ones among those mentioned beside; if "region" please specify which	In force since (date) or *forthcoming	validity timeframe	budget allocated (if any) - specify amount (€) and source	REGULATION CONTENTS	Resilience scope*	If "multiscope", please specifcy which ones among those mentioned beside	addressed hazard*	If "multihazard", please specifcy which ones among those mentioned beside. If "other hazards", please add the description of the other hazards addressed.	main strategies/actions to be implemented	monitoring system (if any)	main results/evidences after the application of the regulation	necessary conditions for the application (replication conditions)	barriers/obstacles in application (e.g. funds availability, public acceptability, etc.)	relevance to SHELTER*	quadrant*	keywords	references (online document)	comments
UNESCO_b_001	al	framework for	Framework	No	DRR	UNISDR	cross-regional	multiscope	settlements,	2015	2015-2030	none	to protect development gains from	multiscope	economic,	multihazards	all	disaster risk, but that responsibility should be	targets and 38 global indicators	practice of countries regarding	none	funds, awareness	medium	specific		.org/implementing-	not a regulation
~~UNESCO_b_002~~	~~international~~	~~Yokohama Strategy and Plan of Action for a Safer World: guidelines for natural disaster prevention, preparedness and mitigation~~	~~DRM guidelines~~			~~UNISDR~~	~~multiscale~~	~~cross-regional~~		~~1994~~	~~?~~	~~none?~~	.					.	.	.	.	~~funds?~~	~~medium~~	~~QD - non-specific hazards and urban/territorial scale~~	.	.	~~not a regulation~~
~~UNESCO_b_003~~	~~international~~	~~Hyogo framework for action 2005-2015: Building the Resilience of Nations and Communities.~~	~~DRM framework~~			~~UNISDR~~	~~multiscale~~	~~cross-regional~~		~~2005~~	~~2005-2015~~	~~none?~~	.					.	.	.	.	~~funds?~~	~~medium~~	~~QD - non-specific hazards and urban/territorial scale~~	.	.	~~not a regulation~~
UNESCO_b_004	IT	riduzione del rischio sismico del patrimonio culturale con riferimento alle norme tecniche per le costruzioni	Regulation	Yes	risk management	DPCM	country	building	/	2011		none	Guidelines for the assessment and mitigation of seismic risk in cultural heritage	cultural		earthquakes		Provide a legal framework for performing structural analysis, assessment and retrofitting tailored to the specific features and needs of CH structures.	none	unknown	approaches could be replicated in other countries or at the European level (i.e. through the Eurocodes - Eurocode 8), but certain aspects would still require	Some aspects of the procedures it involves require advanced knowledge	medium	QC - non-specific hazards and building/district scale		o.beniculturali.it/normativa-e-disposizioni/dpcm-9-febbraio-2011-valutazione-e-riduzione-del-rischio-sismico-del	
UNESCO_b_005	European	Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks	Directive	Yes	risk management	European Parliament - Council of European Union	cross-regional	multiscope	sites, buildings, settlements, landscapes	2007	in force	none	This directive aims to establish a framework for measures to reduce the risk of floods in the EU by assessing the risk of flooding in river basins and coastal regions, mapping out areas that are prone to significant floods and drawing up flood-risk management plans based on close cooperation between the EU countries,	multiscope	cultural; social; economic; environmental	floods		the risk of flooding in coastal regions and river basins by collecting information on those areas, such as past flood history and maps showing borders, land use and topography, and determining the likelihood of future significant floods and their consequences. First published by 22 December 2011, these assessments will be reviewed by 22 December 2018 and then reviewed every 6 years thereafter. EU countries must also produce maps that identify areas prone to significant flood risks and indicate scenarios (based on high, medium or low probability) of a flood occurring there. First published by 22 December 2013, these maps must be reviewed every 6 years. EU countries must also establish flood-risk management plans that are coordinated at the level of the river basin or coastal districts. These plans establish objectives for the management of flood risks, focusing mainly on prevention (e.g. avoiding construction in areas	Flood hazard and risk maps & Flood risk management plan - a description of the prioritisation and the way in which progress in implementing the plan will be monitored	implementation reports https://ec.europa.eu/environment/water/flood_risk/implementation_reports.htm & Floods Directive Scoreboard & Overview on progress https://ec.europa.eu/environment/water/flood_risk/overview.htm	The Directive applies to inland waters as well as all coastal waters across the whole territory of the EU	see here difficulties in implementing the Directive https://pdfs.semanticscholar.org/1691/b4988aba8d2141d8f213ce21bca129f892b.pdf		QB - specific hazards and urban/territorial scale	flood environmental protection public safety environmental risk prevention	https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32007L0060	Guidance docs https://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm
UNESCO_b_006	international	Managing Disaster Risks for World Heritage	Guideline	No	risk management	UNESCO, ICOMOS, ICCROM, IUCN	cross-regional	multiscope	sites, buildings, settlements, landscapes	2010		none	Manual are to help the managers and management authorities of cultural and natural World Heritage	multiscope	cultural, environmental	multihazards	meteorological: hurricanes, tornadoes, heat-	and mitigate disaster risks in cultural heritage properties, to prepare and respond to emergency situations in cultural heritage	none	unknown	none	funds	high	specific hazards and building/site	Managing Disaster Risks, world heritage	https://whc.unesco.org/en/managing-disaster-risks/	not a regulation
UNESCO_b_007	international	Strategy for Risk Reduction at World Heritage Properties	Strategy/policy	No	risk management	UNESCO	cross-regional	site	/	2007		none	to strengthen the protection of World Heritage integrating cultural heritage concerns into national disaster reduction policies and in incorporating concerns for disaster reduction within World Heritage management plans and to provide guidance in integrating DRR into World Heritage strategic planning and management	multiscope	cultural, environmental	non-specific hazard		To strengthen the protection of World Heritage and contribute to sustainable development by assisting Member States in integrating cultural heritage concerns into national disaster reduction policies and in incorporating concerns for disaster reduction within World Heritage management plans. To provide guidance to State Parties, the World Heritage Committee, the World Heritage Centre and the Advisory Bodies to integrate DRR into World Heritage strategic planning and management, including the allocation and use of Emergency Assistance under the World Heritage Fund.	none	unknown	none	funds, unknown	high	QC non-specific hazards and building/site scale	Risk reduction, world heritage	https://whc.unesco.org/archive/2007/whc07-31com-72e.pdf	not a regulation
UNESCO_b_008	international	Reinforcement of UNESCO's action for the protection of culture and the promotion of cultural pluralism in the event of armed conflict. Resolution 38 C/49	Strategy/policy	No	risk management	UNESCO	cross-regional	site	/	2015	2015-2021	none	1,Strengthen the ability of Member States to prevent, mitigate and recover the loss of cultural heritage and diversity as a result of conflict;2,Incorporate the protection of culture into humanitarian action, security strategies and peace-building processes by engaging with relevant stakeholders outside the culture domain.	cultural		other hazards	armed conflicts	Acknowledging that acting in times of peace for the prevention of loss of cultural heritage and diversity has often proven to be the most effective way to protect; activities will be articulated around the three stages of any emergency cycle, namely preparedness, immediate response during conflict and mid- to longer-term recovery/reconstruction. At all three stages, it is important to adopt a comprehensive approach to the protection of culture during conflict, including its legal protection.	undertaken by a variety of mechanisms including quarterly narrative reporting in SISTER and regular reporting to the Executive Board and to the respective intergovernmental Committees and General Assemblies of culture conventions, as well as by the Bureau of Financial Management. Monitoring mechanisms are designed to provide an early indication of the likelihood that expected results will be attained and provide an opportunity to make necessary changes in programme activities and approaches, as appropriate. In addition to these standard monitoring and evaluation processes, specific monitoring and evaluation plans, including, as appropriate, detailed monitoring and evaluation frameworks, are established for extrabudgetary projects in order to	unknown	none	funds, unknown	high	QD - non-specific hazards and urban/territorial scale		https://unesdoc.unesco.org/ark:/48223/pf0000235186	not a regulation
UNESCO_b_009	international	Strategy for the reinforcement of UNESCO's action for the protection of culture and the promotion of cultural pluralism in the event of armed conflict	Strategy/policy	No	risk management	UNESCO	cross-regional	site	/	2017		none	1,Strengthen the ability of State Parties to prevent, mitigate and recover the loss of cultural heritage and diversity as a result of disasters caused by natural and human-induced hazards. 2,Incorporate consideration for culture into the DRR sector and humanitarian action related to disasters by engaging with the relevant stakeholders outside the cultural domain.	multiscope	cultural, environmental	non-specific hazard		the Strategy: Priority 1-to strengthen, centralize and share key baseline information across relevant authorities and agencies, including up-to-date inventories and multi-hazard maps; to build the capacities of national authorities, agencies, site managers and communities to undertake multi-hazard risk assessments for the culture sector and to to disseminate methodologies and tools for assessing risks to intangible cultural heritage; Priority 2-to strengthen the integration of the culture and DRR sectors in the overall agenda at all levels; to develop the capacity for managing disaster risks; to fully integrate communities who are bearers of such ICH knowledge into the overall governance and policy-making processes for DRR planning, mitigation, and recovery at the national and local levels; Priority 3-to promote the broader inclusion of disaster risk management as an integral component of site management plans,	Monitoring of UNESCO activities will be undertaken by a variety of mechanisms including regular narrative reporting in SISTER and statutory EX/4 reports, in the framework of the relevant Expected Results within the approved UNESCO Programme and Budget (C/5). Reports will be also submitted to the relevant intergovernmental committees and general assemblies of culture conventions. In addition to these standard monitoring and evaluation processes, specific monitoring and evaluation plans, including, as appropriate, detailed monitoring and evaluation frameworks, are established for activities funded through earmarked extrabudgetary sources.	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale	protection of culture, disasters risk reduction	https://unesdoc.unesco.org/ark:/48223/pf0000259805	not a regulation

UNESCO_b_010	international	Policy Document on the Impacts of Climate Change on World Heritage Properties	Strategy/policy	No	risk management & CCA	UNESCO	cross-regional	site /		2007		none	this policy document is principally aimed at providing the World Heritage decision / policy-makers with guidance on a limited number of key issues (synergies, research needs and legal issues). For all other general issues dealing with the impacts of climate change on World Heritage properties and management responses document WHC-06/30.COM/7.1 (World Heritage Paper No. 22) should be consulted.	multiscope	cultural, environmental	climate-related		practical tools that can assist managers in developing their adaptive management responses. Options for the creation of a clearing-house mechanism of best-practice case studies on climate change, either separately or linked to similar mechanisms, such as those under the UNFCCC, CBD, UNCCD, or CMS will be investigated. 2. Problems being experienced by managers will be clearly translated into research questions to ensure that gaps in knowledge are identified and are used to inform the development of relevant research programmes and translation of such research into useful guidelines and protocols for best practice.	the reactive monitoring provisions are made more specific as a basis for monitoring of and reporting on the site-specific effects of climate change on World Heritage properties: (a) relating to indications of threats or significant improvement; (b) relating to information on any threat or damage to or loss of outstanding universal value, integrity and/or authenticity; (c) relating to reactive monitoring; in the context of necessary restoration measures to maintain its OUV these will include measures to adapt to the effects of climate change, as well as measures to mitigate those effects, at least at the site level.	unknown	none	funds, unknown	high	QB - specific hazards and urban/territorial scale	climate change adaptation and mitigation, world heritage properties	https://whc.unesco.org/document/10046	not a regulation
UNESCO_b_011	international	UNESCO Strategy for Action on Climate Change	Strategy/policy	No	risk management & CCA	UNESCO	cross-regional	site /		2017		none	to enable Member States to take urgent action to combat climate change and its impacts through education, sciences, culture and information and communication, in line with their respective National Determined Contributions (NDCs) under the COP21 Paris Agreement, and in the overall context of the 2030 Agenda for Sustainable Development and its SDG 11	multiscope	cultural, social, environmental	climate-related		A. Supporting Member States to develop and implement climate change education and public awareness programmes and policies; B. Promoting interdisciplinary climate knowledge and scientific cooperation for climate change mitigation and adaptation; C. Promoting cultural diversity and cultural heritage safeguarding for climate change mitigation and adaptation; D. Supporting inclusive social development, fostering intercultural dialogue and promoting ethical and gender equality principles in relation to climate change mitigation and adaptation;	The implementation of this Strategy will be monitored and reported through the statutory periodic reports to the governing bodies. Evaluation of the Strategy implementation will be undertaken in collaboration with the UNESCO Internal Oversight Service (IOS).8In relation to the Adaptation Fund (AF), UNESCO will adhere to the operational policies and guidelines of the Adaptation Fund (https://www.adaptation-fund.org/apply-funding/policies-guidelines/). 9In relation to the Green Climate Fund (GCF), UNESCO will adhere to the GCF Accreditation Policies and Standards (http://www.greenclimate.fund/partners/accredited-entities/get-accredited).	unknown	none	funds, unknown	medium	QB - specific hazards and urban/territorial scale	climate change, UNESCO designated sites	https://unesdoc.unesco.org/ark:/48223/pf0000259255	not a regulation
UNESCO_b_012	international	Adoption of the Paris Agreement.	Strategy/policy	No	CCA	UNFCCC	cross-regional	multiscope	sites, buildings, settlements, landscapes	2015		none	to adopt the Paris Agreement and to achieve the objective of the Convention as set out in its Article 2: (a) Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change; (b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production; (c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climateresilient development.	multiscope	cultural, social, economic, environmental	climate-related							QB - specific hazards and urban/territorial scale	climate change mitigation and adaptation, nationally determined contribution	https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf	
UNESCO_b_013	international	A/RES/70/1 - Transforming Our World: The 2030 Agenda for Sustainable Development	Strategy/policy	No	risk management & CCA	UN	cross-regional	multiscope	sites, buildings, settlements, landscapes	2015	2015-2030		17 SDGs and 169 targets	multiscope	cultural, social, economic, environmental	non-specific hazard			responsibility for follow-up and review, at the national, regional and global levels, in relation to the progress made in implementing the Goals and targets over the coming 15 years. To support accountability to our citizens, we will provide for systematic follow-up and review at the various levels, as set out in this Agenda and the Addis Ababa Action Agenda.2,The Goals and targets will be followed up and reviewed using a set of global indicators. These will be complemented by indicators at the regional and national levels which will be developed by Member States, in addition to the outcomes of work undertaken for the development of the baselines for those targets where national and global baseline data does not yet exist. The global indicator framework, to be	unknown	none	funds, unknown	medium	QD - non-specific hazards and urban/territorial scale	sustainable development	https://sustainabledevelopment.un.org/post2015/transformingourworld	not a regulation
UNESCO_b_014	international	Risk preparedness: a management manual for world cultural heritage	Guideline	No	risk management	ICCROM, UNESCO, ICOMOS	cross-regional	multiscope	sites, buildings	1998		none	the primary goal would be that of assisting managers of property or buildings to develop their own site-specific risk-preparedness guidelines, adapted to their particular economic, political and cultural circumstances	multiscope	cultural, environmental	multihazards	Fire, earthquakes, floods, other hazards (Tsunami, avalance, winds, etc.)	not applicable		not applicable	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale		http://icorp.icomos.org/wp-content/uploads/2017/10/ICCROM_17_RiskPreparedness_en.pdf	not a regulation
UNESCO_b_015	international	Guidance on Post Trauma Recovery and Reconstruction for World Heritage Cultural Properties	Guideline	No	post disaster recovery	ICOMOS	cross-regional	multiscope	sites, buildings, settlements	2017			by traumatic heritage destruction to assess damage to the explicit or implicit attributes supporting OUV. It sets out a framework for documenting impacts and evaluating options for the identification, re-stablishment, recovery or possible restoration of attributes. In identifying processes to optimise reservation and recovery of attributes, this Guidance notes that widespread destruction may, but does not necessarily mean, the loss of OUV of properties inscribed on the World Heritage list. It recognises also that recovery actions and reconstruction may exacerbate destructive effects of traumatic events or on the contrary, in some cases contribute to creating new values.	multiscope	cultural, social, economic, environmental	multihazards	Earthquakes, storms, flooding, avalanches, landslides and fire	- Documentation and recording of surviving and lost tangible and intangible attributes of OUV, establishing their post trauma status and identifying potential new attributes that support OUV. - Assessment of the impacts of events on the tangible and intangible attributes of OUV, incorporating the input of affected local, national and international stakeholders. - Development of a Statement of Impacts and Identification of Options for recovery of attributes with an assessment of the heritage impacts of actions under each option, leading to the identification of the preferred option. - Development of a Master Plan in consultation with the Advisory Bodies and the World Heritage Centre for the recovery of attributes, defining the objectives of recovery and reconstruction and specifying the approach to be taken to re-establishing attributes. For material assets and attributes it will indicate	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale	organisations; Guidance; Restoration of cultural heritage; reconstruction; outstanding universal value; risk preparedness; criteria; world heritage sites; cultural heritage protection; world heritage properties; natural disasters; armed conflicts;	http://openarchive.icomos.org/1763/	not a regulation
UNESCO_b_016	international	Valletta Principles for the Safeguarding and Management of Historic Cities, Towns and Urban Areas	Strategy/policy	No	risk management	ICOMOS	cross-regional	multiscope	Historic cities, towns and urban areas	2011		none	It propose principles and strategies applicable to every intervention in historic towns and urban areas. These principles and strategies are meant to safeguard the values of historic towns and their settings, as well as their integration into the social, cultural and economic life of our times.	multiscope	cultural, environmental	non-specific hazard		Development of adequate conservation plans for historic towns and urban areas (following the 1987 Charter for the Conservation of Historic Towns and Urban Areas) and development of adequate management plans devised according to the type and characteristics of each historic town and urban area, and their cultural and natural context. It should integrate traditional practices, and be coordinated with other urban and regional planning tools in force.	none	unknown	none	funds, unknown	medium	QD - non-specific hazards and urban/territorial scale		https://www.icomos.org/Paris2011/GA2011_CIVVIH_text_EN_FR_final_20120110.pdf	not a regulation

UNESCO_b_017	international	Charter for the Conservation of Historic Towns and Urban Areas	Strategy/policy	No	risk management	ICOMOS	cross-regional	multiscope	Historic cities, towns and urban areas	1987		none	It defines the principles, objectives, and methods necessary for the conservation of historic towns and urban areas, including from the effects of disasters	multiscope	cultural, environmental	non-specific hazard	2	Development of adequate conservation plans for historic towns and urban areas	none	unknown	none	funds, unknown	medium	QD - non-specific hazards and urban/territorial scale		https://www.icomos.org/Images/DOCUMENTS/Charters/towns_e.pdf	not a regulation
UNESCO_b_018	international	Lima Declaration for Disaster Risk Management of Cultural Heritage	Strategy/policy	No	risk management	ICOMOS	cross-regional	multiscope	sites, buildings, settlements	2010		none	Undertake awareness-raising initiatives to involve decision-makers and local communities in the development and implementation of disaster risk reduction strategies for cultural heritage. Encourage established national and international networks of cultural heritage and disasters to promote the integration of cultural heritage protection into broader disaster management field.	multiscope	cultural, environmental	non-specific hazard	2	heritage in the scope of the assistance programs of various internatio-nal development and cooperation agencies, which should also promote this policy among other multilateral development institutions to which they are a party. Establish expert committees that would enable exchange of opinions to formulate coordinated policies by bringing together multidisciplinary specialists such as structural engineers, architects, archeologists and other cultural heritage specialists. The government should also promote administrative and financial measures that are necessary to establish comprehensive disaster mitigation facilities for cultural heritage properties as well as their surrounding urban environment; Responsible authorities of Cultural heritage and Disaster Mitigation should jointly develop special tools for perio-dical inspection of structural stability of heritage buildings for	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://www.icomos.org/Images/DOCUMENTS/Charters/lima_declaration_2010.PDF	not a regulation
UNESCO_b_019	international	Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage	Guideline	No	risk management & post-disaster recovery	ICOMOS	cross-regional	multiscope	sites, buildings	2003		none	Principles on how to approach the analysis, repair and restoration of structures of architectural heritage.	cultural		non-specific hazard	2	The Principles highlight that any intervention in a cultural heritage construction must be based on a thorough knowledge of its history and structural problems. The intervention process proposed by the Principles must follow three different phases: diagnosis, safety evaluation and design of the intervention. The interventions require a multidisciplinary approach.	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale		https://www.icomos.org/charters/structures_e.pdf	not a regulation
UNESCO_b_020	international	Resolution Impact of Climate Change on Cultural Heritage	Strategy/policy	No	risk management & CCA	ICOMOS	cross-regional	multiscope	sites, buildings, settlements, landscapes	2007		none	Recommending that climate change adaptation strategies for cultural heritage should be mainstreamed into the existing methodologies for preservation and conservation of sites, buildings, settlements, landscapes, movable objects and the living traditions and that appropriate standards and protocols should be developed for the purpose.	multiscope	cultural, environmental	climate-related	2	assess risks to cultural heritage due to climate change and that such assessments should be developed at the macro and micro levels for specific heritage sites. Furthermore, the New Delhi Resolution also refers that strategies for cultural heritage adaptation to climate change should be integrated in specific standards and protocols, emphasizing that cultural heritage needs and concerns should be mainstreamed into institutional processes and policies for DRR. Globally speaking, the Resolution also recommends that governmental and nongovernmental organisations, academic institutions and individuals involved in the conservation and protection of cultural heritage should integrate their actions into national and international protocols for DRR and climate change adaptation; Following a series of actions on this topic since then, ICOMOS has been advocating an approach to issues related to climate change that	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		https://www.icomos.org/climatechange/pdf/New_Delhi_Resolution_EN.pdf	not a regulation
UNESCO_b_021	international	Resolution 19GA 2017/30 Mobilizing ICOMOS and the cultural heritage community to help meet the challenge of climate change	Strategy/policy	No	risk management & CCA	ICOMOS	cross-regional	multiscope	sites, buildings, settlements, landscapes	2017		none	Welcoming the adoption of the Paris Agreement and committing the organization to mobilize the cultural heritage community for climate action. The Resolution encouraged the development of cultural-based solutions to achieve more effective reductions in greenhouse gas emissions, as well as to achieve climate change adaptation, with a focus on vulnerable communities and ecosystems. It also called for enhanced understanding and action with respect to loss and damage, as well as for solidarity with those most impacted by, or least able to bear the cost of, climate change to enable them to safeguard their heritage in the face of a changing climate	multiscope	cultural, environmental	climate-related	2	links and connections for an empowering engagement in the future of heritage conservation; Objective: Develop our membership base and link public authorities, institutions and individuals to ICOMOS programmes, projects and activities.Mission 2: Share research and knowledge of ICOMOS members through active participation, exciting initiatives and solid partnerships; Objective: Using the knowledge of our membership and partner institutions, develop cultural heritagerelated knowledge and expertise through research and projects, and the creation of structures that facilitate all members to contribute and use these through effective information dissemination. Mission 3: Act as leaders in cultural heritage conservation to manage better the challenges of the future; Objective: Reaffirm the role of ICOMOS as a leading advocate and think-tank for the conservation of cultural heritage	none	unknown	none	funds, unknown	medium	QA - specific hazards and building/site scale		https://www.icomos.org/Images/DOCUMENTS/General_Assemblies/19th_Delhi_2017/19th_GA_Outcomes/GA2017_Resolutions_EN_20180206finalcirc_pdf	not a regulation
UNESCO_b_023	international	The Future of Our Pasts: Engaging Cultural Heritage in Climate Action. International Council on Monuments and Sites	Report	No	risk management & CCA	ICOMOS Climate Change and Heritage Working Group	cross-regional	multiscope	sites, buildings, settlements, landscapes	2019		none	Showing that cultural heritage offers immense and virtually untapped potential to drive climate action and support ethical and equitable transitions by communities towards low carbon, climate resilient development pathways. Highlighting that better recognition of the cultural dimensions of climate change and adjusting the aims and methodologies of heritage practice are needed to realize that potential.	multiscope	cultural, environmental	climate-related	2	not applicable	none	unknown	none	funds, unknown	medium	QA - specific hazards and building/site scale		https://indd.adobe.com/view/a9a551e3-3b23-4127-99fd-a7a80d91a29e	not a regulation
UNESCO_b_023	international	Climate Vulnerability Index (CVI) A systematic tool to rapidly assess climate change risk to World Heritage	Tool	No	CCA	James Cook University, ICOMOS, Australian Marine Conservation Society, Union of Concerned Scientists, ARC Centre for Coral Reef Studies	cross-regional	multiscope	sites, buildings, settlements, landscapes	2019		none	The Climate Vulnerability Index (CVI) is a rapid assessment tool that is distinct from other vulnerability assessments in that it evaluates:OUV Vulnerability; and Community Vulnerability for all types of World Heritage properties.	multiscope	cultural, environmental	climate-related	2	The CVI is based on a risk assessment approach, but differs from previous vulnerability assessments as it comprises two distinct stages, assessing:OUV Vulnerability (OUV = Outstanding Universal Value, the central concept for World Heritage); and Community Vulnerability-based on the economic, social and cultural dependencies upon the WH property, and the adaptive capacity of these to cope with climate change,for all types of World Heritage properties (cultural, natural and mixed).	none	unknown	none	funds, unknown	medium	QA - specific hazards and building/site scale		https://cvi-heritage.org	not a regulation
UNESCO_b_024	international	The ABC Method:	Tool	No	risk management	ICCROM,	cross-regional	multiscope	sites, buildings,	2016		none	Step-by-step guide on applying the	multiscope	cultural,	multihazards	all	Step-by-step procedure and a variety of tools	none	unknown	none	funds, unknown	high	QC - non-		https://www.iccro	not a regulation
UNESCO_b_025	international	Guide to Risk Management. International Centre for the Study of the Preservation and Restoration of Cultural Property	Tool	No	risk management	ICCROM, Canadian Conservation Institute	cross-regional	multiscope	sites, buildings, settlements	2016		none	The guide explains the ABC method using several images, basic examples and simple exercises. The guide was designed to introduce the risk-based approach to decision-makers and to promote its use by heritage professionals and a younger generation of conservators.	multiscope	cultural, environmental	multihazards	all	Step-by-step procedure and a variety of tools to guide the users in applying the ABC method for risk assessment. The ABC method can be applied to a range of situations, from the analysis of a single risk to a comprehensive risk assessment of the entire heritage asset.	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale		https://www.iccrom.org/sites/default/files/2017-12/risk_management_guide_english_web.pdf	not a regulation
UNESCO_b_026	international	Venice	Strategy/policy	No	risk management	UNDRR (UNISDR)	cross-regional	multiscope	sites, buildings,	2012		none	It refers the need to develop	cultural		non-specific	2	the main recommendations of the Venice	none	unknown	none	funds, unknown	high	QC - non-	cities	https://www.preve	not a regulation
UNESCO_b_027	international	ISO 13822 Bases	Standard	No	risk assessment	ISO	cross-regional	building	/	2010		none	Principles on how to approach the	cultural		non-specific	/	The contents of the annex of this document,	none	unknown	none	funds, unknown	medium	QC - non-	structural	https://www.iso.or	Annex of a standard

UNESCO_b_028	international	Handbook and toolkit on First Aid to Cultural Heritage in Times of Crisis	Guideline	No	disaster preparedness and response	ICCROM	cross-regional	multiscope	sites, buildings, settlements	2018		none	It will help to improve emergency preparedness within cultural heritage institutions, serve as a reference to train others, and act as a guide for planning and implementing coordinated cultural heritage first aid; to codify the First Aid processes and further stimulate research, activity and awareness.	cultural		multihazards	Earthquake, flood, Tsunami, Tornado, fire, Volcano, warfare, terror, vandalism	3 STEP EXPLANATION: Handbook is tailored for providing first aid for all types of cultural heritage in multiple locations. Step 1: Situation analysis Situation analysis provides understanding of the wider context of the emergency. It enables first aiders to develop a context-specific plan for on-site actions. An in-depth situation analysis is carried out at the end of the emergency phase in order to determine mid- to long-term needs for the recovery of cultural heritage. Step 2: On-site damage and risk assessment On-site damage and risk assessment allows the identification and recording of damage caused and risks posed to cultural heritage in the aftermath of a disaster. The outcomes of this step help to determine priorities for on-site actions.Step 3: Security and stabilisation Security and stabilisation includes actions that help to contain damage and reduce risks, taking affected heritage one step closer to recovery.	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale		https://www.iccrom.org/news/pioneering-resource-first-aid-cultural-heritage-now-available	not a regulation
UNESCO_b_029	international	Endangered Heritage: Emergency Evacuation of Heritage Collections	Guideline	No	disaster preparedness and response	UNESCO&ICCROM	cross-regional	multiscope	sites, buildings	2016		none	It provides step-by-step guidance for evacuating cultural collections under extreme conditions. It is meant to assist those communities and institutions, which are trying to prevent the destruction and looting of cultural objects during a crisis situation. It can be used to train others and to improve emergency preparedness at cultural sites.	multiscope	cultural, environmental	non-specific hazard	/	a simple work flow is provided that can be customized to meet the needs of a specific emergency context: assess, prepare, document, pack and move, relocate and store	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale	Evacuation inventory, emergency situations, relocation	https://www.iccrom.org/publication/endangered-heritage-emergency-evacuation-heritage-collections	not a regulation
UNESCO_b_030	international	Radenci Declaration on the Protection of Cultural Heritage in Emergencies and Exceptional Situations	Strategy/policy	No	risk management	ICBS (which involves ICOMOS, ICOM, ICA, IFLA) , UNESCO	cross-regional	multiscope	sites, buildings, settlements	1998		none	to avoid loss or damage to cultural heritage in the event of emergencies by improving prevention, preparedness, response and recovery measures; to link parties to form durable networks; to establish and update emergency plans with clear needs and priorities; to draw up programmes for dissemination of information to the general public and to decision makers; to train personnel and developing their skills.	cultural		non-specific hazard	/	resources; Establishing collaborative agreements with related institutions covering such areas as personnel, specialised equipment, temporary refuges; Developing good working relationships with emergency services; Producing information, such as manuals of emergency procedures and inventories of internal and external resources; Carrying out regular training sessions including exercises and drills of emergency procedures in association with partners; Setting up joint liaison committees with partners; Ensuring adequate inventories and documentation of the institution's holdings, including remote back up copies; Providing adequate safety and specialised emergency equipment and supplies; Promoting the adoption and implementation of international conventions on cultural heritage; Developing the skills of people intervening in response to disasters by producing training materials and tools;	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale	Assess and reduce risk, Improve response capacity	https://theblueshield.org/the-1998-radenci-declaration-on-the-protection-of-cultural-heritage-in-emergencies-and-exceptional-situations/	not a regulation
UNESCO_b_031	international	Torino Declaration. Resolutions of the First Blue Shield International Meeting, Torino, Italy.	Strategy/policy	No	risk management	ICBS (which involves ICOMOS, ICOM, ICA, IFLA)	cross-regional	multiscope	sites, buildings, settlements	2004		none	The document proposes a series of recommendations for protecting cultural heritage in case of disasters caused by man-made or natural hazards that may affect both movable and immovable cultural heritage	cultural		non-specific hazard		The document emphasizes the importance of risk preparedness, response and recovery for cultural heritage protection, and recommends that cultural heritage professionals integrate these stages into their programmes and activities. Furthermore, it also recommends that ICA, ICOM , ICOMOS and IFLA national members create a National Committee of the Blue Shield, in countries where it does not exist, and lobby for national authorities to support these committees so they can operate to protect movable and immovable cultural heritage in case of disasters. Finally, the Torino Declaration also states, for the first time, the decision to establish and strengthen ICBS as a visible and effective entity	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://archive.ifla.org/VI/4/admin/torino-declaration2004.pdf	not a regulation
UNESCO_b_032	~~international~~	~~Universal Declaration on Cultural Diversity. Records of the General Conference, 31st session~~	~~disaster preparedness and response~~		~~Declaration~~	~~UNESCO~~				~~2001~~																	~~http://portal.unesco.org/en/ev.php-URL_ID=13179&URL_DO=DO_TOPIC&URL_SECTION=201.html~~
UNESCO_b_033	international	The 1954 Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict and its two (1954 and 1999) Protocols	Convention	No	disaster preparedness and response	UNESCO	cross-regional	multiscope	sites, buildings, settlements, landscapes	1954-1999		none	The convention requires that States Parties adopt protection measures during peacetime and times of conflict for the safeguarding of cultural property	multiscope	cultural, environmental	multihazards	armed conflict, mostly	implementation of the following measures: - Adoption of peacetime safeguarding measures such as the preparation of inventories, the planning of emergency measures for protection against fire or structural collapse, the preparation for the removal of movable cultural property or the provision for adequate in situ protection of such property, and the designation of competent authorities responsible for the safeguarding of cultural property; - Respect for cultural property situated within their own territory as well as within the territory of other States Parties by refraining from any use of the property and its immediate surroundings or of the appliances in use for its protection for purposes likely to expose it to destruction or damage in the event of armed conflict; and by refraining from any act of hostility directed against such property;	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://unesdoc.unesco.org/ark:/48223/pf0000187580	
UNESCO_b_034	international	Seoul Declaration on the Protection of Cultural Heritage in Emergency Situations.	Strategy/policy		disaster preparedness and response	ICBS (which involves ICOMOS, ICOM, ICA, IFLA)	cross-regional	multiscope	sites, buildings, settlements	2011		none	The document partially reaffirms previous ICBS declarations and assessments (in particular the Radenci Declaration), highlighting the importance of protecting cultural heritage in emergency situations.	cultural		non-specific hazard		mobilising intellectual, technical, logistical and financial resources, before, during and after a disaster, between different professional bodies and stakeholders involved in cultural heritage recovery. The document also refers that ICBS will explore: - the feasibility of establishing a fund for immediate relief efforts in emergency situations involving cultural heritage. - the procedures needed to adequately plan and prepare the response to emergency situations involving cultural heritage. - the feasibility of developing partnerships with cultural and relief organisations to improve the operational response in emergency situations involving cultural heritage. The document also refers that, given the mandates of the institutions that form ICBS, this organisation should be the focal point for coordinated international rescue and relief	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://theblueshield.org/general-assembly-2011-seoul-korea/	not a regulation
UNESCO_b_035	~~international~~	~~Heritage Planning: Principles and Process.~~	~~disaster preparedness and response~~		~~study~~					~~2014~~																	

UNESCO_b_036	~~international~~	~~Report of the Open-Ended Intergovernmental Expert Working Group on Indicators and Terminology Relating to Disaster Risk Reduction.~~	~~disaster preparedness and response~~		~~Report~~	~~UN~~			~~2016~~																~~https://www.unisdr.org/we/inform/publications/51748~~	
UNESCO_b_037	~~international~~	~~"Build back better" approach to disaster recovery: Research trends since 2006.~~	~~disaster preparedness and response~~		~~study~~	~~Fernandez, G., Ahmed, I.~~			~~2019~~																~~https://www.sciencedirect.com/science/article/pii/S3590061719300031~~	
UNESCO_b_038	international	Revive the Spirit of Mosul	Project	No	post disaster recovery	UNESCO, UN-Habitat	city	multiscope	sites, buildings, settlements	2018		unknown	Project for the reconstruction of Mosul where the "build back better" concept is expected to be implemented for developing a people-centred vision for the future of the city	multiscope	cultural, social, economic, environmental	non-specific hazard		The primary goal of the project is to foster reconciliation and social cohesion in Mosul and its Old Town, through the restoration and reconstruction of Al-Nouri Mosque and its Al-Hadba Minaret as iconic landmarks, as well as a Memorial. The project includes skills development and job creation components to provide young men and women from Mosul with a source of livelihood through the heritage rehabilitation, the educational and cultural institutions reviva	unknown	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://en.unesco.org/fieldoffice/baghdad/revivemosul	not a regulation
UNESCO_b_039	international	Cultural heritage and community recovery in post-tsunami Aceh.	Study	No	post disaster recovery	Daly, P. Rahmayati, Y.	region	multiscope	sites, buildings, settlements	2012		none	Research study on the implementation of the "build back better" concept involving the cultural heritage and community recovery in Aceh, Indonesia, after the 2004 tsunami	multiscope	cultural, social, economic, environmental	multihazards	earthquake, tsunami	The study discusses how the "build back better" concept failed to account for Acehnese cultural and social practices, thus undermining important mechanisms to ensure an internally-driven social rehabilitation of the area	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://www.researchgate.net/publication/288295761_Cultural_heritage_and_community_recovery_in_Post-Tsunami_Aceh	not a regulation
UNESCO_b_040	international	Culture in City Reconstruction and Recovery	Study	No	post disaster recovery	UNESCO, World Bank	cross-regional	multiscope	sites, buildings, settlements	2018		none	The document proposes a framework that mainstreams culture into post-disaster city reconstruction and recovery, integrating people-centred and place-based policies	multiscope	cultural, social, economic, environmental	non-specific hazard		The document refers that the proposed framework is expected to overcome the issues with existing reconstruction and recovery approaches, such as those based on the "build back better" concept whose emphasis is said to be mostly on the quality of the built environment and its resilience to future disasters. As such, the proposed framework highlights that the culture of communities, which includes their tangible and intangible cultural heritage as well as their cultural and creative industries, plays a vital role in post-disaster recovery and reconstruction. Still, most of the framework appears to be built around aspects connected to intangible features of cultural heritage and communities, and little is said with respect to issues that should be accounted for when envisaging the physical reconstruction of cultural heritage.	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://openknowledge.worldbank.org/handle/10986/3073	not a regulation
UNESCO_b_041	international	Proceedings of the Decisions adopted during the 40th Session of the World Heritage Committee	Meeting Proceedings	No	post disaster recovery	UNESCO World Heritage Committee	cross-regional	multiscope	sites, buildings, settlements	2016		none	The document establises the shortcomings of cultural heritage policies in providing guidance for a practical and inclusive reconstruction process in a post-disaster scenario	multiscope	cultural, social, economic, environmental	non-specific hazard		The World Heritage Committee recommends that further support for threatened or damaged World Heritage properties be pursued, through technical assistance, capacity-building, and exchange of best practices in this regard	unknown	The Warsaw Recommendation on Recovery and Reconstruction of Cultural Heritage was produced	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://whc.unesco.org/archive/2016/whc16-40com-19-en.pdf	not a regulation
UNESCO_b_042	international	Warsaw Recommendation on Recovery and Reconstruction of Cultural Heritage.	Recommendation	No	post disaster recovery	UNESCO World Heritage Centre	cross-regional	multiscope	sites, buildings, settlements	2018		none	The document establishes a set of non-exhaustive principles and specific recommendations in order for the World Heritage Committee to continue the reflection on the complex multidisciplinary process that is reconstruction within World Heritage properties.	multiscope	cultural, social, economic, environmental	non-specific hazard		- the importance of understanding the values of a heritage site and the attributes that carry these values prior to taking any decision on a proposal for reconstruction and recovery. Simultaneously, values identified by local communities and new values resulting from the traumatic events associated with the destruction should also be integrated in this process. - the need to follow people-centred approaches and fully engage communities and relevant stakeholders in reconstruction and recovery processes. - the importance of proper documentation and inventories. - the need for establishing a strong governance based on a fully participatory process that includes mechanisms that coordinate national and international actors. - the adoption of the historic urban landscape approach [41], to set out a holistic planning	unknown	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale		https://whc.unesco.org/en/news/1826	not a regulation
UNESCO_b_043	international	Operational Guidelines for the Implementation of the World Heritage Convention	Guideline	No	post disaster recovery	UNESCO	cross-regional	multiscope	sites, buildings, settlements	2019		none	Series of instructions to signatory nations regarding the proper implementation of the 1972 Convention Concerning the Protection of the World Cultural and Natural Heritage	multiscope	cultural, social, economic, environmental	non-specific hazard		in tems of issues relevant to post disaster recovery, reference is made to the connection between reconstruction and authenticity as discussed in paragraphs 79 to 86. In particular, paragraph 86 states that reconstruction of archaeological remains or historic buildings or districts is justifiable only in exceptional circumstances, and that reconstruction is acceptable only on the basis of complete and detailed documentation and to no extent on conjecture.	unknown	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale		https://whc.unesco.org/en/guidelines/	not a regulation
UNESCO_b_044	~~international~~	~~Recommendation on the Historic Urban Landscape. Records of the General Conference, 36th session, Paris.~~	~~disaster preparedness and response~~		~~Recommendation~~	~~UNESCO~~			~~2011~~																~~https://unesdoc.unesco.org/ark:/48223/pf0000215084~~	

UNESCO_b_045	international	Riga Charter on Authenticity and Historical Reconstruction in Relationship to Cultural Heritage	Strategy/policy	No	post disaster recovery	ICCROM/Latvian National Commission for UNESCO/State Inspection for Heritage Protection of Latvia.	cross-regional	multiscope	sites, buildings, settlements	2000		none	The document revisits the debate on post-disaster reconstruction of cultural heritage	cultural		non-specific hazard		This document defines reconstruction of cultural heritage as an evocation, interpretation, restoration or replication of a previous form. This document was drafted following concerns related to reconstruction and authenticity issues in several former Soviet countries that had recently regained independence. From a doctrinal point of view, this document became a warning regarding the use of re-invented monuments as symbolic narratives to build national identity and redefine national history. In the document, authenticity and reconstruction are particularly connected when referring that "replication of cultural heritage is in general a misrepresentation of evidence of the past, and that each architectural work should reflect the time of its own creation, in the belief that sympathetic new buildings can maintain the environmental context"	unknown	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		http://conservacion.inah.gob.mx/normativa/wp-content/uploads/Documento66.pdf	not a regulation
UNESCO_b_046	international	~~A viewpoint on the reconstruction of destroyed UNESCO Cultural World Heritage Sites.~~	~~disaster preparedness and response~~		~~study~~	~~Roha W. Khalaf~~				~~2017~~																~~http://openarchive.icomos.org/1745/1/Accepted%20Manuscript%20of%20A%20viewpoint%20on%20the%20reconstruction%20of%20destroyed%20UNESCO%20Cultural%20World%20Heritage%20Sites.pdf~~	
UNESCO_b_047	international	~~International Council on Monuments and Sites.~~	~~disaster preparedness and response~~		~~Annual Report~~	~~ICOMOS~~																				~~http://www.icomos.org/images/DOCUMENTS/Secretariat/Annual_Reports/RA_2016_ICOMOS_EN_final.pdf~~	
UNESCO_b_048	international	~~Post-Trauma Reconstruction. Proceedings of the 1-day Colloquium at ICOMOS Headquarters, Volumes 1 and 2, Paris, France.~~	~~disaster preparedness and response~~		~~Meeting Proceedings~~	~~ICOMOS~~				~~2016~~																~~http://openarchive.icomos.org/1707/~~	
UNESCO_b_049	international	~~International Council on Monuments and Sites.~~	~~disaster preparedness and response~~		~~Annual Report~~	~~ICOMOS~~				~~2017~~																~~https://www.icomos.org/images/DOCUMENTS/Secretariat/Annual_Reports/RA_2017_ICOMOS_EN_DP_hd_2.pdf~~	
UNESCO_b_050	international	~~How ICOMOS fuels discussion on reconstruction as a dynamic process.~~	~~disaster preparedness and response~~		~~article~~	~~ICOMOS~~																				~~https://unesdoc.unesco.org/ark:/48223/pf0000261522~~	
UNESCO_b_051	European	Protecting the cultural heritage from natural disasters. Policy department structural and cohesion policies, Culture and Education, European Parliament, IP/B/CULT/IC	Study	No	risk management	Drdacky, M., Binda, L., Herle, I., Lanza, L. G., Maxwell, L. I., Pospisil, S.	cross-regional	multiscope	sites, buildings	2007		none	The study described examples of best practices, and discussed problems and shortcomings of current European approaches for risk management of cultural heritage	cultural		non-specific hazard		action after analysing the current EU legislation and defined, among others, the following policy and high-level strategic needs: - European policy, legislative and institutional frameworks for protecting cultural heritage from disaster risks and impacts. - European strategies and operational procedures that integrate the protection of cultural heritage, to ensure timely and effective rescue in emergency situations. - Capacity-building plans and programmes to meet the requirements for cost-effective protection of cultural heritage from natural hazards. - Resources for the development and implementation of measures to protect cultural heritage from natural disasters. - Mobilisation of Member States to demonstrate strong political determination and willingness to integrate cultural heritage protection measures into national policies and	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		http://www.europarl.europa.eu/RegData/etudes/etudes/join/2007/369029/IPOL-CULT_ET(2007)369029_EN.pdf	not a regulation
UNESCO_b_052	European	Work Plan for Culture (2015 - 2018).	Strategy/policy	No	risk management	Council of the European Union.	cross-regional	multiscope	sites, buildings, settlements	2014		none	Document where the Council of the EU and representatives of the governments of the Member States agreed to address and pursue a series of priorities and actions connected to four main areas: accessible and inclusive culture; cultural heritage; cultural and creative sectors; promotion of cultural diversity, culture in EU external relations and mobility	multiscope	cultural, social, economic, environmental	non-specific hazard		In the actions related to the priority cultural heritage, DRR issues are only mentioned in a field referring that a study would be developed by the European Commission to address the topics of risk assessment and prevention for safeguarding cultural heritage from the effects of natural disasters and threats caused by human action, as well as the mapping of existing strategies and practices at the national level.	unknown	The referred study was developed: Safeguarding Cultural Heritage from Natural and Man-Made Disasters - A Comparative Analysis of Risk Management in the EU	none	funds, unknown	low	QB - specific hazards and urban/territorial scale		https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2014.463.01.0004.01.ENG	not a regulation
UNESCO_b_053	European	Safeguarding Cultural Heritage from Natural and Man-Made Disasters - A Comparative Analysis of Risk Management in the EU	Study	No	risk management	Bonazza, A., Maxwell, I., Drdácky, M., Vintzileou, E., Hanus, C., Ciantelli, C., De Nuntiis, P., Oikonomopoulou, E., Nikolopoulou, V., Pospíšil, S.	cross-regional	multiscope	sites, buildings, settlements	2018		none	Address the topics of risk assessment and prevention for safeguarding cultural heritage from the effects of natural disasters and threats caused by human action in the EU, as well as the mapping of existing strategies and practices at the national level	cultural		non-specific hazard	Climate change, air pollution changes and environmental degradation, flood, landslide, fire, earthquake, volcanic eruption, wind, armed conflict	Recalls the main shortcomings of the 2007 study "Protecting the cultural heritage from natural disasters. Policy department structural and cohesion policies, Culture and Education, European Parliament, IP/B/CULT/IC"	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale		https://op.europa.eu/en/publication-detail/-/publication/8fe9ea60-4cea-11e8-be1d-01aa75ed71a1	not a regulation
UNESCO_b_054	European	Work Plan for Culture 2019-2022	Strategy/policy	No	risk management	Council of the European Union.	cross-regional	multiscope	sites, buildings, settlements	2018		none	Document where the Council of the EU and representatives of the governments of the Member States agreed to address and pursue a series of priorities and actions connected to five main areas: sustainability in cultural heritage; cohesion and well-being; an ecosystem supporting artists, cultural and creative professionals and European content; gender equality; international cultural relations	multiscope	cultural, social, economic, environmental	climate-related		In the actions related to the priority sustainability in cultural heritage, one is related to adaptation to climate change and refers the importance of focusing the safety of heritage under extreme climate circumstances	unknown	unknown	none	funds, unknown	medium	QB - specific hazards and urban/territorial scale		https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1574271151897&uri=CELEX:52018XG1221(01)	not a regulation

UNESCO_b_055	European	European Framework for Action on Cultural Heritage. Commission Staff Working Document SWD(2018) 491 final	Strategy/policy	No	risk management	European Commission	cross-regional	multiscope	sites, buildings, settlements	2018		none	The Framework promotes and puts into practice an integrated and participatory approach to cultural heritage, and contributes to the mainstreaming of cultural heritage across EU policies.	cultural		non-specific hazard		Pillar 3 of the framework is defined as Cultural heritage for a resilient Europe: safeguarding endangered heritage that addresses, among other issues, the protection of cultural heritage against natural disasters and climate change. It sets a tentative list of actions that will be pursued to implement the objectives of each pillar. In the case of Pillar 3, these include, among other actions, supporting research and capacity building projects to improve the understanding of disaster risks to cultural heritage, through the collection of disaster loss data, to further investigate the impact of natural disasters on cultural heritage and to strengthen preventive measures.	unknown	unknown	none	funds, unknown	medium	QD - non-specific hazards and urban/territorial scale		https://ec.europa.eu/culture/file/1689/download_en?token=6AQEEVFI.	not a regulation
UNESCO_b_056	European	Action Plan on the Sendai Framework for Disaster Risk Reduction 2015-2030 - A disaster risk-informed approach for all EU policies. Commission Staff Working Document SWD(2016) 205 final/2	Strategy/policy	No	risk management	European Commission	cross-regional	multiscope	sites, buildings, settlements	2016		none	The document builds on the Sendai Framework to further enhance and promote disaster risk management and its integration in EU policies	multiscope	cultural, social, economic, environmental	non-specific hazard		With respect to cultural heritage, the Action Plan highlights the need to integrate cultural heritage in national DRR strategies developed by EU Member States. Additionally, it also emphasizes the need to ensure the exchange of information among Member States on existing strategies and practices for risk assessment and prevention for safeguarding cultural heritage from natural and man-made disasters, within the framework of the European Agenda for Culture.	unknown	unknown	none	funds, unknown	medium	QD - non-specific hazards and urban/territorial scale		https://ec.europa.eu/echo/sites/echo-site/files/sendai_swd_2016_205_0.pdf	not a regulation
UNESCO_b_057	~~European~~	~~Council Decision of 23 October 2001 establishing a Community mechanism to facilitate reinforced cooperation in civil protection assistance interventions. Council Decision 2001/792/EC, Euratom~~	~~DRM/DRR~~		~~Decision~~	~~the Council of the European Union~~				~~2001~~																~~https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32001D0792.~~
UNESCO_b_058	~~European~~	~~Council Decision of 8 November 2007 establishing a Community Civil Protection Mechanism (recast) (Text with EEA relevance). Council Decision 2007/779/EC, Euratom.~~	~~DRM/DRR~~		~~Decision~~	~~the Council of the European Union~~				~~2007~~																~~https://eur-lex.europa.eu/cli/dec/2007/779(2)/oj.~~
UNESCO_b_059	~~European~~	~~Decision No 1313/2013/EU of the European Parliament and of the Council of 17 December 2013 on a Union Civil Protection Mechanism Text with EEA relevance.~~	~~DRM/DRR~~		~~Decision~~	~~the European Parliament and the Council of the European Union~~				~~2013~~																~~https://eur-lex.europa.eu/eli/dec/2013/1313/oj~~
UNESCO_b_060	European	Decision (EU) 2019/420 of the European Parliament and of the Council of 13 March 2019 amending Decision No 1313/2013/EU on a Union Civil Protection Mechanism	Strategy/policy	Yes	disaster preparedness and response	the European Parliament and the Council of the European Union	cross-regional	multiscope	sites, buildings, settlements	2019		none	The Union Civil Protection Mechanism aims to strengthen cooperation in the field of civil protection, with an emphasis on disaster prevention, preparedness, and response	multiscope	cultural, social, economic, environmental	non-specific hazard		In the context of protection, the Union Civil Protection Mechanism (UCPM) establishes that it will cover primarily people, but also the environment and property, including cultural heritage, against all kinds of natural and man-made disasters, including the consequences of acts of terrorism, technological, radiological or environmental disasters, marine pollution, and acute health emergencies.	Member States are required to regularly share with the European Commission information about their risk assessments and about their risk management capability, focusing on key risks. Although not explicitly stated in the UCPM, this implies that such national risk assessments should be performed for all sectors, or at least those covered by the scope of the UCPM, which includes cultural heritage.	unknown	none	funds, unknown	medium	QD - non-specific hazards and urban/territorial scale		https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019D0420	not a regulation
UNESCO_b_061	~~European~~	~~Copernicus programme~~	~~DRM/DRR~~		~~Programme~~	~~European Commission.~~				~~2017~~																~~https://www.copernicus.eu/en/about-copernicus.~~
UNESCO_b_062	European	Copernicus services in support to cultural heritage	Study	No	risk management	European Commission	cross-regional	multiscope	sites, buildings, settlements	2019		unknown	Study analysing the possibility of starting an institutional action for promoting the use of Copernicus data for cultural heritage preservation, monitoring and management	multiscope	cultural, social, economic, environmental	non-specific hazard		The study has identified 373 user requirements expressed by cultural heritage user communities, where many of them can be directly related to needs for risk assessment and management, as well as for disaster preparedness and emergency. By using all Copernicus capabilities (core services products, Sentinels and Contributing missions), 64.1% of cultural heritage user requirements could be covered. Nevertheless, 35.9% of cultural heritage user requirements will not be covered by the Copernicus programme (core services products, Sentinels and Contributing missions).	none	unknown	none	funds, unknown	high	QD - non-specific hazards and urban/territorial scale		https://op.europa.eu/en/publication-detail/-/publication/220f385f-76bd-11e9-9f05-01aa75ed71a1/	not a regulation

UNESCO_b_063	European	Recommendation of the Committee of Ministers to member States on the European Cultural Heritage Strategy for the 21st century. CM/Rec(2017).	Recommendation	No	risk management	Council of Europe.	cross-regional	multiscope	sites, buildings	2017		none	The document draws attention to the impacts of climate change on cultural heritage, given their influence in the rate of degradation and the loss in value of cultural heritage, since these impacts may then lead to other impacts in other sectors, such as cultural tourism, local or regional economies,	cultural		climate-related		The document suggests the following actions that can be related to the need to have more quantitative information about the impacts of climate change on cultural heritage - Identify relevant leads for these research studies and topics (top-down and bottom-up approaches) - Encourage an interdisciplinary and international approach to heritage - Disseminate the results of studies and research to professionals, decision makers and users - Evaluate and ensure the sustainability of studies and research	none	unknown	none	funds, unknown	low	QA - specific hazards and building/site scale		https://rm.coe.int/16806f6a03	not a regulation
UNESCO_b_064	~~European~~	~~European and Mediterranean Major Hazards Agreement.~~	~~DRM/DRR~~		~~Agreement~~	~~Council of Europe~~				~~1987~~																	~~https://www.coe.int/en/web/europarisks/eur-opa-in-brief~~
UNESCO_b_065	European	Recommendation 2009 - 1 on Vulnerability of Cultural Heritage to Climate Change, adopted at the 57th meeting of the Committee of Permanent Correspondents of the EUR-OPA Agreement, Dubrovnik, Croatia, 15-16 October 2009	Recommendation	No	risk management	Council of Europe	cross-regional	multiscope	sites, buildings, settlements	2009		none	The document addresses address issues related to the effect of climate change on cultural heritage	cultural		climate-related		The document suggests the following actions: - assess the risk to cultural heritage from climate change. - identify cultural assets at higher risk and evaluate necessary preventive and adaptation measures. - promote the adoption of emergency planning for sites most vulnerable to events such as floods, landslides, coastal erosion and extreme weather-related events. - promote at inter-agency cooperation on climate change and cultural heritage, integrating heritage concerns into DRR policies.	none	unknown	none	funds, unknown	medium	QA - specific hazards and building/site scale		https://www.coe.int/en/web/europarisks/recommendations	not a regulation
UNESCO_b_066	European	Recommendation CM/Rec(2018)3 of the Committee of Ministers to member States on cultural heritage facing climate change: increasing resilience and promoting adaptation	Recommendation	No	risk management	Council of Europe	cross-regional	multiscope	sites, buildings, settlements	2018		none	The document addresses address issues related to the effect of climate change on cultural heritage	cultural		climate-related		The document integrates Recommendation 2009 - 1 and suggests the following actions: - ensure the inclusion of cultural heritage in their policies and strategies for adaptation to climate change. - assess the economic value of cultural heritage lost to climate change.	none	unknown	none	funds, unknown	medium	QB - specific hazards and urban/territorial scale		https://www.coe.int/en/web/europarisks/recommendations	not a regulation
UNESCO_b_067	European	Managing fire safety in historical buildings. CFPA-E Guideline No 30:2013 F	Guideline	No	risk management	Confederation of Fire Protection Associations Europe	cross-regional	multiscope	sites, buildings	2013		none	Guideline addressing the fire protection of cultural heritage aimed at owners, managers, caretakers and other responsible for the safety of historical buildings	cultural		other hazards	Urban fire	This guideline provides knowledge about basic, simple, low-cost actions to protect historic buildings from fire, and also indicates routes to more advanced ways of protection. Moreover, it briefly addresses the importance of regularly performing risk assessments, actions related to prevention of fire spread, evacuation, salvage of items of historic value, staff training, and aspects to account for to ensure an effective intervention of fire brigades.	none	unknown	none	funds, unknown	medium	QA - specific hazards and building/site scale		http://cfpa-e.eu/wp-content/uploads/files/guidelines/CFPA_E_Guideline_No_30_2013_F.pdf	not a regulation
UNESCO_b_068	European	COST C17 - Built Heritage: Fire Loss to Historic Buildings. European Cooperation in Science and Technology	Project	No	risk management	European Cooperation in Science and Technology - COST	cross-regional	multiscope	sites, buildings	2006		none	COST Action addressing the fire protection of cultural heritage	cultural		other hazards	Urban fire	The results of the project indicated several measures to address fire safety in cultural heritage. Some of these measures are integrated in Managing fire safety in historical buildings. CFPA-E Guideline No 30:2013 F	none	unknown	none	funds, unknown	medium	QA - specific hazards and building/site scale		https://www.cost.eu/actions/C17	not a regulation
UNESCO_b_069	European	ProCultHer - Protecting Cultural Heritage from the Consequences of Disasters Decision	Project	No	Disaster preparedness and emergency response	European Commission	cross-regional	multiscope	sites, buildings	2019		800000	Project contributing to develop the capacities of UCPM Participating States to protect cultural heritage in case of disasters	cultural		non-specific hazard		The project is going to: - Establish a European methodology for the protection of cultural heritage in emergency situations. - Establish a multi-national civil protection capacity to provide guidance and support for cultural heritage first aid during emergencies.	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale		https://www.procuther.eu/	not a regulation
UNESCO_b_070	~~European~~	~~Joint Declaration on Post-Crisis Assessments and Recovery Planning.~~	~~Declaration~~		~~Declaration~~	~~European Commission.~~				~~2008~~																	~~https://ec.europa.eu/fpi/what-we-do/joint-declaration-post-crisis-assessments-and-recovery-planning_en~~
UNESCO_b_071	European	Post-Disaster Needs Assessment - Guidelines.	Tool	No	post disaster recovery	European Commission, United Nations Development Group, World Bank	cross-regional	multiscope	sites, buildings, settlements	2014		none	Methodology provides a framework to determine human recovery needs and to value damages and losses after a disaster	multiscope	cultural, social, economic, environmental	non-specific hazard		The methodology has a chapter dedicated to the culture sector that covers damage to both tangible and intangible heritage. Additionally, this chapter also covers losses to repositories of heritage (e.g. museums, libraries, archives, etc.) and to cultural and creative industries (i.e. infrastructure, resources and processes for the production, distribution and sale of creative cultural goods).	none	unknown	none	funds, unknown	high	QD - non-specific hazards and urban/territorial scale		https://www.undp.org/content/undp/en/home/librarypage/crisis-prevention-and-recovery/pdna.html	not a regulation
UNESCO_b_072	European	Valuing damage and losses in cultural assets after a disaster	concept paper	No	post disaster recovery	CEPAL–SERIE Estudios y perspectivas, 56, United Nations Publication, Mexico.	cross-regional	building		2006		none	Discusses methodologies to value losses in cultural heritage after a disaster	multiscope	cultural, social, economic	non-specific hazard		Discusses several existing approaches and proposes a new approach that was integrated in the PDNA for the Culture sector	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale		https://repositorio.cepal.org/handle/11362/4979	not a regulation
UNESCO_b_073	~~European~~	~~EUSF (2002). Council regulation (EC) No. 2012/2002 of 11 November 2002 establishing the European Union Solidarity Fund.~~	~~disaster preparedness and response~~		~~post disaster recovery~~	~~Council of the European Union~~				~~2002~~																	~~https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32002R2012~~

UNESCO_b_074	European	EUSF (2014) Regulation (EU) No. 661/2014 of the European Parliament and of the Council of 15 May 2014 amending Council Regulation (EC) No. 2012/2002 establishing the European Union Solidarity Fund.	Post-disaster recovery mechanism	Yes	post disaster recovery	Council of the European Union	cross-regional	multiscope	sites, buildings, settlements	2014		variable	European instrument to fund post-disaster recovery	multiscope	cultural, social, economic, environmental	non-specific hazard		Mechanism for financial aid to EU Member State and candidate countries experiencing "serious repercussions on living conditions, the natural environment or the economy" following a disaster caused by a natural hazard. The aid is limited to non-insurable damages and essential emergency and recovery operations. These include infrastructure restoration in the fields of energy, water and waste water, telecommunications, transport, health and education, temporary accommodation and rescue services, preventive infrastructure and measures of protection for cultural heritage, and cleaning up disaster-stricken areas, including natural zones.	unknown	unknown	none	funds, unknown	medium	QD - non-specific hazards and urban/territorial scale		https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014R0661	not a regulation
UNESCO_b_075	~~European~~	~~Post-Disaster Needs Assessment (PDNA).~~	~~disaster preparedness and response~~			~~European Commission~~				~~2017~~																	~~https://ec.europa.eu/jrc/what-we-do/post-disaster-needs-assessment-pdna_en~~
UNESCO_b_076	Albania	Law No. 27/2018 Për trashëgiminë kulturore dhe muzetë On cultural heritage and museums, Fletorja Zyrtare, Viti 2018, Numri 86, Republic of Albania	National Law	Yes	risk management	Albanian Government	country	multiscope	building, site	2018		none	National law addressing the protection of cultural heritage	multiscope	cultural, environmental	non-specific hazard		The law refers the need to establish measures for the protection of cultural heritage against disasters (from natural or man-made events) and to determine its exposure to risks. In the context of natural events, the law makes a specific reference to seismic risk, recognizing the importance of addressing this particular issue. The new Law defines restoration as an intervention that should preserve the "original essence of the cultural heritage property" and prevent further degradation. However, for cultural heritage properties located in earthquake-prone areas, restoration includes structural strengthening actions to improve the seismic safety of the property.	The Ministry in charge of cultural heritage exercises protection functions for state-owned cultural assets. In exercising this function, the ministry responsible for cultural heritage monitors and periodically evaluates the actions of entities in the management of cultural property.	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		http://planifikimi.gov.al/index.php?HD=dumpFile&t=f&f=4013&token=226df4ac6d637e59f1afb6d0d458ee99ea3dSc3c	
UNESCO_b_077	Albania	Using traditional water cisterns to fight fire: A pilot project in two	Pilot project	No	emergency preparedness	CHwB - Cultural Heritage without Borders Albania.	city	building		2017		none	Pilot project involving the use of traditional water cisterns to provide water for firefighting	cultural		other hazards	urban fire	This pilot project involved the installation of a pumping system within the cistern of selected houses that is then connected to a hydrant on the street outside the house. This hydrant can	unknown	unknown	none	funds, unknown	medium	QA - specific hazards and building/site scale		http://chwbcrgrabania/news/using-traditional-water-cisterns-to-fight-	not a regulation
UNESCO_b_078	UK	National Heritage Act 1980 (as amended 2007)	National Law	Yes	none	UK Government	country	multiscope	sites, buildings, settlements, landscapes	2010		none	National law addressing the protection of cultural heritage	multiscope	cultural, environmental			This law does not address issues related to risk assessment or risk management	unknown	unknown	none	funds, unknown	low	QC - non-specific hazards and building/site scale		https://www.eui.eu/Projects/InternationalArtHeritageLaw/UnitedKingdom	
UNESCO_b_079	UK	Fire Safety for Traditional Church Buildings.	Guideline	No	risk management, emergency preparedness	Historic England	cross-regional	building		2017		none	The document provides advice on dealing with issues related to fire risk in churches	cultural		other hazards	urban fire	The guide addresses issues to enhance the understanding of fire risk and its dynamics, proposes actions to reduce the risk of fire and	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site		https://historicengland.org.uk/images-books/publications/	not a regulation
UNESCO_b_080	UK	of Fires in Thatched Properties with	Report	No	risk management	Historic England	cross-regional	building		2018		none	Guidance on measures to reduce the risk of fire in properties with thatched roofs	cultural		other hazards	urban fire	- guidance on a series of best practices for fire risk reduction. - a data collection form to improve post-fire	none	unknown	none	funds, unknown	medium	hazards and building/site scale		and.org.uk/advice/technical-advice/emergency-	not a regulation
UNESCO_b_081	UK	Flooding and Historic Buildings.	Report	No	emergency preparedness, post-disaster	Historic England	cross-regional	building		2015		none	Guidance on measures to manage flood risk in historiac buildings	cultural		floods		measures as well as on the inspection, conservation and repair of historic buildings after flooding. In particular, the guide provides	none	unknown	none	funds, unknown	high	hazards and building/site scale		and.org.uk/advice/technical-advice/flooding-	not a regulation
UNESCO_b_082	UK	Protecting historical buildings and heritage in	Guidelines	No	risk management	London Fire Brigade.	cross-regional	multiscope	building, site	2019		none	Online guidance on fire prevention techniques for heritage building	cultural		other hazards	urban fire	Provides advice on: - heritage Fire Risk Assessments - emergency Response and Salvage Plans	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site		https://www.london-fire.gov.uk/about-us/what-we-	not a regulation
UNESCO_b_083	UK	General Notice 80 - Fire Safety Guidance Note:	Guideline	No	risk management, emergency preparedness,	London Fire Brigade.	cross-regional	multiscope	building, site	2015		none	This guidance provides information on historic buildings and the damage control /salvage of artefacts and	cultural		other hazards	urban fire	The guidance provides practical advice for the fire safety of historic or heritage buildings and also discusses legal issues related to the topic.	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site		https://www.london-fire.gov.uk/media/	not a regulation
UNESCO_b_084	~~UK~~	~~Heritage Fire Risk Assessments.~~	~~DRM assessment.~~			~~London Fire Brigade.~~				~~2019~~																	~~https://www.london-fire.gov.uk/safety/property/~~
UNESCO_b_085	GR	Law no. 3028/2002	National Law	Yes	post-disaster reconstruction (slightly relevant)	Greek government	country	multiscope	building, site	2002		none	National law addressing the protection of cultural heritage	multiscope	cultural, environmental	non-specific hazard		With respect to post-disaster reconstruction, the Law refers that if a monument has suffered serious damage, a committee defined by the Ministry of Culture, and comprised of multidisciplinary specialists, must inspect and evaluate the damage prior to the development of repair and recovery measures. For this scenario, the Law refers that such	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://www.eui.eu/Projects/InternationalArtHeritageLaw/Greece	no specific procedures or documents to address Disaster preparedness and emergency response
UNESCO_b_086	GR	Pre-earthquake assessment of monuments.	Guideline	No	risk assessment	European Centre on Prevention and Forecasting of Earthquakes.	country	building		2016		none	Simplified earthquake safety assessment procedure that can be used as an administrative tool for the comparative classification of historic buildings and help governmental authorities in prioritizing the implementation of risk reduction measures	cultural		earthquakes		The guideline provides a detailed description of the assessment procedure that needs to be implemented, namely during the on-site visit to obtain the necessary data, as well as several illustrative examples. The guideline also recommends that, before performing the on-site visit, relevant data should be obtained from the services managing the construction, namely data related to past interventions that may have been performed. The guideline refers that the assessment should be carried out by two engineers with adequate knowledge about historic constructions and their repair/restoration.	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		https://ecpfe.oasp.gr/sites/default/files/PRE-EARTHQUAKE%20MONUM.pdf	not a regulation
UNESCO_b_087	GR	Second level pre-earthquake assessment for masonry buildings.	Guideline	No	risk assessment	European Centre on Prevention and Forecasting of Earthquakes.	country	building		2012		none	Earthquake safety assessment of masonry buildings that can be adapted to cultural heritage constructions made of masonry	cultural		earthquakes		The guideline provides a detailed description of the assessment procedure that needs to be implemented for masonry buildings, but that can be adapted to cultural heritage constructions made of masonry, as long as some adaptations are made to account for the special nature of cultural heritage.	none	unknown	none	funds, unknown	medium	QA - specific hazards and building/site scale		https://ecpfe.oasp.gr/sites/default/files/Pr%20PRE-EARTHQUAKE%20MASONRY.pdf	not a regulation
UNESCO_b_088	GR	Regulation on evaluation and structural masonry interventions	Regulation	No	risk assessment	EPPO	country	building	?? (in preparation)			none	Technical standard for the safety assessment of masonry structures and the design of strengthening interventions	cultural		non-specific hazard		The standard provides a detailed description of the safety assessment procedures and the design of strengthening interventions for masonry structures, and refers that its procedures may be applicable to certain type of monuments	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://www.oasp.gr/userfiles/1_ΚΑΔΕΤ_ΜΑΡΤΙΟΣ_2019.pdf	standard in preparation
UNESCO_b_089	GR	Draft framework regulatory document for structural interventions and seismic protection of monuments.	Regulation	No	risk assessment	EPPO	country	building	2011 (draft)			none	Standard targeting the design of adequate structural interventions for the seismic protection of cultural heritage monuments	cultural		earthquakes		The standard provides a description of the safety assessment procedures and the design of strengthening interventions for cultural heritage monuments	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		https://ecpfe.oasp.gr/sites/default/files/ENGLISH%20VERSION.pdf	standard in preparation

UNESCO_b_090	ITA	Valutazione e riduzione del rischio sismico del patrimonio culturale con riferimento alle norme tecniche per le costruzioni di cui al decreto ministeriale 14 gennaio 2008. Direttiva del Presidente del Consiglio dei Ministri 9 febbraio 2011. Gazzetta Ufficiale n. 47 del 26/02/2011 - suppl. ord. n. 54. (in Italian)	Regulation	Yes	risk assessment	Italian government	country	Building	2011		none	The standard provides a framework for performing structural analysis, assessment and retrofitting tailored to the specific features and needs of heritage structures.	cultural		earthquakes		The standard offer three possible levels of analysis for assessing the seismic performance of a given construction, namely LV1, LV2, and LV3. Each level increases the complexity of the analysis and, simultaneously, requires an increasing amount of information regarding structural details and materials properties	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		http://www.veneto.beniculturali.it/normativa-e-disposizioni/dpcm-9-febbraio-2011-valutazione-e-riduzione-del-rischio-sismico-del	
UNESCO_b_091	ITA	Linea guida per la valutazione, in deroga, dei progetti di edifici sottoposti a tutela ai sensi del d.lgs. 22 gennaio 2004, n. 42, aperti al pubblico, destinati a contenere attività dell'allegato 1 al D.P.R. 1 agosto 2011. Corpo Nazionale dei Vigili del Fuoco. (in Italian)	Guideline	No	risk assessment	VVF	country	Building	2016		none	Guideline published by the Italian fire brigade to address fire safety issues in cultural heritage buildings.	cultural		other hazards	urban fire	A guideline to assist designers in defining adequate fire safety measures for situations where normal fire risk reduction are not able to be implemented. The guideline provides help for performing a preliminary fire risk assessment (for occupants and for valuable contents) whose outcome is then used to determine the strategy and the technical solutions that will ensure a fire safety level equivalent to that of regular buildings	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		https://www.insic.it/GetAllegato.aspx?GuidAllegato=6977379b-4da5-4034-a05d-ba7ec781731b	
UNESCO_b_092	~~ITA~~	~~D1/08/2011, Regolamento recante semplificazione della disciplina dei procedimenti relativi alla Prevenzione degli incendi a norma dell'articolo 49, comma 4 quater, del decreto-legge 31 maggio 2010, n. 78, convertito con modificazioni dalla legge 30 luglio 2010, n. 122. Gazzetta Ufficiale della Repubblica Italiana, Serie~~	~~DRM~~			~~DPDR~~			~~2011~~																	- ~~http://www.vigilfuoco.it/aspx/ReturnDocument.aspx?IdDocumento=4993~~	
UNESCO_b_093	~~ITA~~	~~per l'attuazione della Direttiva 2007/60/CE relativa alla valutazione ed alla gestione dei rischi di alluvioni con riferimento alla predisposizione delle mappe della pericolosità e del rischio idraulico. Decreto Legislativo n. 49/2010) – Documento Conclusivo del Tavolo Tecnico Stato-Regioni. Direzione~~	~~DRM~~			~~Ministero dell'Ambiente e della Tutela del Territorio e del Mare.~~			~~2013~~																	~~http://www.minambiente.it/sites/default/files/archivio/allegati/vari/documento_definitivo_indirizzi_operativi_direttiva_alluvioni_gen_13.pdf~~	
UNESCO_b_094	ITA	Beni culturali esposti a frane e alluvioni - Edizione 2018. Istituto Superiore per la Protezione e la Ricerca Ambientale.	Tool (map)	No	risk assessment	ISPRA	country	Building	2018		none	Risk maps that combine the flood and landslide hazard maps for the Italian territory for different hazard levels with georeferenced data about the cultural heritage assets	cultural		multihazards	flood, landslide	Not applicable	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site/district scale		https://annuario.isprambiente.it/ada/basic/6858	not a regulation
UNESCO_b_095	ITA	Carta del Rischio	Tool (map)	No	risk assessment	MiBACT	country	Building	2019		none	Georeferenced tool that was developed to identify actions that need to be implemented to protect cultural heritage assets across the country.	cultural		multihazards	Environmental, structural, anthropic	Not applicable	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		http://www.cartadelrischio.beniculturali.it/	not a regulation
UNESCO_b_096	~~ITA~~	~~Vincoli In Rete. Istituto Superiore per la Conservazione ed il Restauro.~~	~~DRM~~			~~VIR~~			~~2019~~																	~~http://vincoliinrete.beniculturali.it/VincoliInRete/Vir/Istituto/login~~	
UNESCO_b_097	PT	Lei n.º 107/2001. Diário da República n.º 209/2001, Série I-A de 2001-09-08. Assembleia da República.	National Law	Yes	risk management	Portuguese government	country	multiscope building, site	2001		none	National law addressing the protection of cultural heritage	multiscope	cultural, environmental	non-specific hazard		The Law does not address or describe specific DRR or DRM measures for the safeguard of cultural heritage. Still, it highlights that, if a given listed heritage asset (or heritage asset in the process of being listed) is at risk (with likely impacts ranging from different types of damage/degradation to total destruction), the competent body of the central/regional/municipal administration must implement the necessary measures to ensure the safeguard of the asset. Although this issue may not have been initially thought for risk scenarios involving intense natural hazards, its vagueness allows it to account for different types of threats and hazards.	none	unknown	none	funds, unknown	low	QC - non-specific hazards and building/site/district scale		https://data.dre.pt/eli/lei/107/2001/09/08/p/dre/pt/html	

UNESCO_b_098	PT	Portaria n.º 265/2019. Diário da República n.º 162/2019, Série I de 2019-08-26. Cultura.	National Law	Yes	risk management	Portuguese government	country	building	2019		none	National law addressing the multiannual management plans of museums, monuments and palaces	cultural		non-specific hazard		Law that establishes the minimum conditions that multiannual management plans of museums, monuments and palaces need to include when their management structure is autonomous from the central government. In particular, these management plans need to establish a strategic plan integrating several objectives and goals that must be achieved across a series of domains. Among these, the plan needs to establish the necessary measures to ensure the protection and integrity of the cultural heritage property, including the development of an emergency plan.	none	unknown	none	funds, unknown	low	QC - non-specific hazards and building/site scale		https://data.dre.pt/eli/port/265/2019/08/26/p/dre	
UNESCO_b_099	PT	Decreto-Lei n.º 220/2008. Diário da República n.º 220/2008, Série I de 2008-11-12. Ministério da Administração Interna.	National Law	Yes	risk management	Portuguese government	country	building	2008		none	Regualtion defining the conditions that must be followed by museums, art galleries, libraries and archive in terms of fire safety	cultural		other hazards	Urban fire	Provides the design rules for developing adequate fire safety measures for museums, art galleries, libraries and archives. Furthermore, under certain conditions, which depend on the size/configuration of the building, the type of use and the fire load (among other things), the development of an emergency plan may be also required. Since meeting the required fire safety conditions in a cultural heritage building is often incompatible with the preservation of heritage values, the legislation also establishes exceptions that allow designers to define alternative fire safety measures.	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		https://data.dre.pt/eli/dec-lei/220/2008/11/12/p/dre/pt/html	
UNESCO_b_100	PT	Lei n.º 27/2006. Diário da República n.º 126/2006, Série I de 2006-07-03. Assembleia da República.	National Law	Yes	risk management	Portuguese government	country	multiscope sites, buildings, settlements	2006		none	Legal framework that establishes the scope of the national civil protection activities and objectives	multiscope	all	non-specific hazard		The document refers that cooperation initiatives can be established with institutions that have relevant expertise in certain fields, in order to facilitate the implementation of the objectives of the national civil protection, referring specifically aspects related to risk assessment and to the protection of cultural heritage	none	unknown	none	funds, unknown	medium	QD - non-specific hazards and urban/territorial scale		https://data.dre.pt/eli/lei/27/2006/p/cons/20150803/pt/html	
UNESCO_b_101	PT	Methodology for the rapid evaluation of seismic risk in immovable cultural heritage. Report for the National Authority for Civil Protection. Construction Institute and Faculty of Engineering, University of Porto, Porto (in Portuguese).	Tool (procedure)	No	risk assessment	X. Romão, E. Paupério, N. Pereira	country	building	2015		none	Procedure for the rapid evaluation of seismic risk in immovable cultural heritage	cultural		earthquakes		The document establishes a general framework for risk assessment in cultural heritage that is then detailed for the case of seismic risk assement. It provides rapid assessment procedures for 4 types of cultural heritage	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale			
UNESCO_b_102	~~PT~~	~~National platform for disaster risk reduction – Activities. Autoridade Nacional de Emergência e Proteção Civil > Autoridade Nacional de Emergência e Proteção Civil.~~	~~DRM~~			~~PNRRC~~			~~2019~~																~~http://www.prrc.pt/index.php/atividades/~~	
UNESCO_b_103	~~PT~~	~~Notre-Dame: "Não quero sequer pensar que este incêndio pode acontecer nos jerónimos". – Ipsilon, Público.~~	~~DRM~~			~~Público~~			~~2019~~																~~https://www.publico.pt/2019/04/17/culturaipsilon/noticia/nao-quero-sequer-pensar-incendio-acontecer-jeronimos-1869524~~	
UNESCO_b_104	~~PT~~	~~RIACT - Risk Indicators for the Analysis of Cultural heritage under Threat. POCI-01-0145-FEDER-030469. Faculty of Engineering of the University of Porto.~~	~~DRM~~			~~RIACT~~			~~2018~~																~~https://www.researchgate.net/project/RIACT-Risk-Indicators-for-the-Analysis-of-Cultural-heritage-under-Threat-POCI-01-0145-FEDER-030469.~~	
UNESCO_b_105	ES	Guía de prevención de incendios en edificios de interés patrimonial en Castilla y León.	Guideline	No	risk management	Junta de Castilla y León/Unidad de Gestión de Riesgos y Emergencias en el Patrimonio Cultural de Castilla y León (UGRECYL)	region	building	2017		none	Guidance for fire risk reduciotn in cultural heriage.	cultural		other hazards	urban fire, forect fire	The document provides guidance on: - how to prevent or reduce the risk of fires - how to act in the case of fires in order to safeguard heritage collections and other movable heritage elements. - how to reduce the risk of fire during renovation works in a heritage construction, particularly for situations that may involve hot works.	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		https://patrimoniocultural.jcyl.es/web/jcyl/binarios/793/162/Guia%20emergencias%202019_2%C2%AA%20edici%C3%83n.PDF	not a regulation
UNESCO_b_106	CH	Loi fédérale no. 520.3 sur la protection des biens culturels en cas de conflit armé, de catastrophe ou de situation d'urgence.	National Law	Yes	(relevant to) risk management	Swiss government	country	multiscope building, site	2016		none	National law addressing the general context of the protection of cultural property in the event of armed conflict, natural disaster or emergency	cultural		non-specific hazard		The document defines the main concepts and sets the legal framework for the protection of cultural property in the event of armed conflict, natural disaster or emergency	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://www.admin.ch/opc/fr/classified-compilation/20122172/index.html	
UNESCO_b_107	CH	Ordonnance no. 520.31 sur la protection des biens culturels en cas de conflit armé, de catastrophe ou de situation d'urgence.	National Law	Yes	(relevant to) risk management	Swiss government	country	multiscope building, site	2016		none	National law addressing the practical implementation of the protection of cultural property in the event of armed conflict, natural disaster or emergency	cultural		non-specific hazard		The document refer that Cantons (the top tier administrative subdivisions of the country) are tasked with the development of detailed inventories of their cultural heritage properties. It also refers that adequate training will be provided to civil protection officials responsible for the protection of cultural heritage, as well as for the staff of cultural institutions	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://www.admin.ch/opc/fr/classified-compilation/20132905/index.html	

UNESCO_b_108	CH	Ordonnance no. 520.311 du DDPS sur l'établissement de documentations de sécurité et de reproductions photographiques de sécurité.	National Law	Yes	(relevant to) risk management	Swiss government	country	multiscope building, site	2016		none	National law setting the rules for the documentation of cultural property	cultural		non-specific hazard		For the case of built cultural heritage, the document refers that detailed inventories should include architectural plans, building plans, as well as photogrammetric and digital planar and spatial data for individual or groups of heritage buildings, for architectural and artistic details, as well as for frescoes and wall structures. Furthermore, these inventories should also include any type of scientific document (text or graphic) seen to be a relevant source of information about the cultural heritage properties, as well as past reports and other documentation related to past interventions	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://www.admin.ch/opc/fr/classified-compilation/20152486/index.html	
UNESCO_b_109	CH	~~PCP Forum - Journal for Protection of Cultural Property. Issues. Federal Office for Civil Protection.~~				~~PCPF~~			~~2019~~																~~https://www.babs.admin.ch/en/suche.html?q=babs/kgs/prints.html~~	
UNESCO_b_110	UK	Fire Advice	Repository of resources	No	risk management	Historic England	country	building	2019		none	Advice on emergency planning and on how to prepare for fire emergencies in cultural heritage	cultural		other hazards	Urban fire	The website provides access to several resources	none	unknown	none	funds, unknown	medium	QA - specific hazards and building/site scale		https://historicengland.org.uk/advice/technical-advice/emergency-and-fire/fire-advice/	not a regulation
UNESCO_b_111	UK	Writing an Emergency Response Plan. Historic England.	Guideline	No	Disaster preparedness and emergency response	Historic England	country	building	2019		none	Guidance for developing emergency response plans for heritage buildings	cultural		other hazards	Urban fire	Guidance and detailed templates for developing emergency response plans for different types of heritage buildings either smaller or larger in size, which include adequate procedures for evacuating and salvaging movable heritage objects and collections	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		https://historicengland.org.uk/advice/technical-advice/emergency-and-fire/response-plans/	not a regulation
UNESCO_b_112	UK	Salvage and Disaster Recovery Course.	Course/training	No	emergency preparedness	Historic England	country	building	2019		none	Salvage and disaster recovery course for an effective response during an emergency incident and to mitigate loss and damage to heritage assets	cultural		other hazards	Urban fire	The course provides training on how to develop an effective response during an emergency incident to mitigate loss and damage to heritage assets. This course provides hands-on experience of removing objects from an incident location, assessing of the condition of those objects, and following appropriate first-aid treatment and documentation procedures. Participants also learn about how to use essential salvage equipment safely.	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		https://historicengland.org.uk/advice/technical-advice/emergency-and-fire/preparedness-training/	not a regulation
UNESCO_b_113	UK	Emergency Response and Salvage Plans for heritage buildings	Repository of resources	No	emergency preparedness	London Fire Brigade	country	building	2019		none	Guidance on issues related to preparedness for fire emergencies for protecting historic or heritage buildings in London	cultural		other hazards	Urban fire	The website provides access to several resources	none	unknown	none	funds, unknown	medium	QA - specific hazards and building/site scale		https://www.london-fire.gov.uk/safety/property-management/fire-safety-in-heritage-and-historical-buildings/emergency-response-and-salvage-plans-for-heritage-buildings/	not a regulation
UNESCO_b_114	UK	How to write a salvage plan	Guideline	No	Disaster preparedness and emergency response	London Fire Brigade	country	building	2019		none	Guidance for developing emergency response and salvage plans for heritage buildings	cultural		other hazards	Urban fire	In terms of emergency response plans, some guidance is provided, but it also directs the user to the guidance provided by Historic England. It provides detailed guidance for developing salvage plans, including several templates for creating inventories of priority objects, inventories of salvaged objects, salvage recovery areas, lists of salvage equipment, among others	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		https://www.london-fire.gov.uk/safety/property-management/fire-safety-in-heritage-and-historical-buildings/emergency-response-and-salvage-plans-for-heritage-buildings/how-to-write-a-salvage-plan/	not a regulation
UNESCO_b_115	UK	Training for heritage staff	Course/training	Yes	Disaster preparedness and emergency response	London Fire Brigade	country	building	2019		none	Guidance on fire safety training for heritage staff	cultural		other hazards	Urban fire	The website provides access to several resources	none	unknown	none	funds, unknown	medium	QA - specific hazards and building/site scale		https://www.london-fire.gov.uk/safety/property-management/fire-safety-in-heritage-and-historical-buildings/training-for-heritage-staff/	not a regulation
UNESCO_b_116	ITA	Diretive (Post-event damage assessment forms)	Tool	Yes	Disaster preparedness and emergency response	MiBACT	country	building	2015		none	Post-disaster damage survey forms were specifically developed for immovable and movable cultural heritage	cultural		multihazards	earthquake, flood	Post-disaster damage survey forms to collect damage data	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		https://www.beniculturali.it/mibac/export/MiBAC/sito-MiBAC/MenuPrincipale/Normativa/Direttive/index.html	
UNESCO_b_117	ITA	Approvazione del manuale per la compilazione della scheda per il rilievo del danno ai beni culturali, Chiese.	Manual	Yes	Disaster preparedness and emergency response	Dipartimento della Protezione Civile.	country	building	2013		none	Detailed manual to help filling the post-disaster damage survey form for churches	cultural		earthquakes		Point-by-point analysis of the parts of the form with illustrative examples	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		http://www.protezionecivile.gov.it/amministrazione-trasparente/provvedimenti/dettaglio/-/asset_publisher/default/content/dpcm-del-13-marzo-2013-approvazione-del-manuale-per-compilare-la-scheda-di-rilievo-del-danno-ai-beni-culturali	

UNESCO_b_118	ITA	Schede Tecniche di Opere Provvisionali (STOP)	Manual	No	Disaster preparedness and emergency response	Corpo Nazionale dei Vigili del Fuoco.	country	multiscope	building, site	2011		none	Detailed information sheets for emergency shoring operations	cultural		multihazards		The manual illustrates the most common design solutions to secure damaged buildings, as well as the necessary construction details. The purpose of this manual is to make the definition of on-site emergency shoring works implemented by fire brigades easy and practical, starting from the earliest stages of the emergency. In the case of cultural heritage assets, similar stabilization solutions can also be implemented, but normally under the guidance of professionals with experience in cultural heritage. The stabilization solutions that are included in the manual were identified by taking into account the means and the techniques used by the Italian fire brigades, the type of materials that are usually available and issues related to building operations, e.g. safety of workers, simplicity and speed of implementation, etc	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale		http://www.vigilfuoco.it/aspx/Page.aspx?idPage=5934	not a regulation
UNESCO_b_119	ITA	DL 189/2016 coordinato col Decreto fiscale 148/2017 convertito in legge 172/2017	National Law	Yes	Disaster preparedness and emergency response	Italian government	country	multiscope	sites, buildings, settlements	2017		none	Provisions for the treatment and transport of materials deriving from the collapse of buildings due to earthquakes	multiscope		earthquakes		The document defines the general legal framework for the treatment and transport of materials deriving from the collapse of buildings due to earthquakes	none	unknown	none	funds, unknown	medium	QA - specific hazards and building/site scale		https://sisma2016.gov.it/2017/12/13/decreto-legislativo-1892016-coordinato-col-decreto-fiscale-1482017-convertito-legge-172/	
UNESCO_b_120	ITA	Circolare n.53/2017 Allegato 1	National Law	Yes	Disaster preparedness and emergency response	MiBACT	country	multiscope	sites, buildings, settlements	2017		none	Provisions for the treatment and transport of materials deriving from the collapse of cultural heritage due to earthquakes	cultural		earthquakes		The document defines procedures for the removal and recovery of rubble of protected properties and historic buildings. This rubble is classified into three types: A – of listed heritage assets, B – of historic assets, C – of assets of no cultural significance. Type A rubble should be preserved in-situ as much as possible, while types B and C must be transferred to temporary deposit sites for a more detailed identification and selection of relevant cultural or architectural elements.	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		https://www.beniculturali.it/mibac/export/MiBAC/sito-MiBAC/Contenuti/Avvisi/visualizza_asset.html_1170328863.html	
UNESCO_b_121	~~ITA~~	~~The 2016–2017 Central Apennines seismic sequence: analogies and differences with recent Italian earthquakes. In Recent Advances in Earthquake Engineering in Europe: 16th European Conference on Earthquake Engineering, Thessaloniki 2018. Springer International Publishing.~~	~~Disaster preparedness and emergency response~~			~~Dolce, M., Di Bucci, D.~~				~~2018~~																;	
UNESCO_b_122	~~ITA~~	~~Earthquakes, Reconstruction and Monumental Heritage. Conservation Science in Cultural Heritage, 18 (1), 41-64.~~	~~Disaster preparedness and emergency response~~			~~Carbonara, G.~~				~~2018~~																;	
UNESCO_b_123	~~ITA~~	~~Lo stato di avanzamento dei lavori nelle aree colpite dal Sisma 2016-2017. Osservatorio Sismma.~~	~~Disaster preparedness and emergency response~~			~~OS~~				~~2018~~																~~http://osservatoriosisma.it/wp-content/uploads/2018/12/OsservatorioSisma-StatoavanzamentoDicembre2018.pdf.~~	
UNESCO_b_124	PT	Decreto-Lei n.º 138/2009. Diário da República n.º 113/2009, Série I de 2009-06-15	National Law	Yes	Disaster preparedness and emergency response	Portuguese government	country	multiscope	building	2009		none	Creates a Safeguard Fund for Cultural Heritage (defined in UNESCO_b_100)	cultural		non-specific hazard		One of the objectives of the Safeguard Fund for Cultural Heritage is that it can be used in emergency situations to safeguard cultural heritage assets that may have ben affected	none	unknown	none	funds, unknown	high	QA - specific hazards and building/site scale		https://data.dre.pt/eli/dec-lei/138/2009/06/15/p/dre/pt/html	
UNESCO_b_125	ES	Plan Nacional de Emergencias y Gestión de Riesgos en Patrimonio Cultural	National Law	Yes	Disaster preparedness and emergency response	Spanish government	country	multiscope	sites, buildings, settlements	2015		none	Legal framework to address DRR issues for cultural heritage	cultural		non-specific hazard		The main objectives are: - To define measures to protect cultural heritage assets from disasters. - To define resources and protocols for emergency actions addressing the rescue and safeguard of cultural heritage in case of disasters. - To design instruments and coordination mechanisms between institutions acting in emergency situations and dealing with the safety of people and assets that integrate concerns with the safeguard of cultural heritage.	none	unknown	none	funds, unknown	high	QD - non-specific hazards and urban/territorial scale		https://sede.educacion.gob.es/publiveta/plan-nacional-de-emergencias-y-gestion-de-riesgos-en-patrimonio-cultural/patrimonio-historico-artistico/20705C	
UNESCO_b_126	~~ES~~	~~Plan Nacional de Emergencias y Gestión de Riesgos en Patrimonio Cultural. Ministerio de Educación, Cultura y Deporte.~~	~~Disaster preparedness and emergency response~~			~~MECD.~~				~~2015~~																~~http://www.toledo.es/wp-content/uploads/2017/03/plan-nacional-de-emergencias-y-gestion-de-riesgos-en-el-patrimonio-cultural.pdf.~~	
UNESCO_b_127	ES	Convocatorias de gestión de riesgos y emergencias. Junta de Castilla y León.	Course/training	No	Disaster preparedness and emergency response	Junta de Castilla y León	region	multiscope	sites, buildings, settlements	2019		none	Training and capacity building actions to deal with cultural heritage in emergency situations	cultural		non-specific hazard		Training and capacity building actions to train and articulate field procedures with other emergency units (such as the Military Emergency Unit) and to provide knowledge and experience to the emergency units of different provinces of the region	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale		https://patrimoniocultural.jcyl.es/web/jcyl/PatrimonioCultural/es/Plantilla100/1284751838421/_/_/_	not a regulation

UNESCO_b_128	ES	Documentos de referencia del Plan Nacional de Emergencias y Gestión de Riesgos en Patrimonio Cultural.	Guidance	No	Disaster preparedness and emergency response	Spanish government	country	multiscope	sites, buildings	2015		none	Guidance for heritage managers, conservators and restorers to develop emergency management plans for cultural heritage assets in their institutions	cultural		non-specific hazard		The guidance is divided into four phases (analysis, prevention, response and recovery) and includes procedures for the implementation of the first two and protocols for the third. Regarding the latter, it is noted that these response protocols are particularly detailed but are mostly focussed on the safeguard of movable heritage assets. Actions to be carried out in the fourth phase, recovery, are not detailed since they will depend on multiple disaster-specific aspects.	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale		http://www.culturaydeporte.gob.es/planes-nacionales/planes-nacionales/emergencias-y-gestion-riesgos/documentos-referencia.html	not a regulation
UNESCO_b_129	ITA	Linee di indirizzo metodologiche e tecniche per la ricostruzione del patrimonio culturale danneggiato dal sisma del 24 agosto 2016 e seguenti.	Guideline	No	post-disaster reconstruction and recovery	Italian government	country	multiscope	sites, buildings, settlements	2017		none	Guidelines for post-earthquake reconstruction to establish the admissible contexts for the reconstruction of damaged buildings in historic centres	multiscope	cultural, social, economic, environmental	earthquakes		the guidelines involve: - Repair and recovery of historic and monumental buildings. - Partial reconstruction of buildings with cultural elements or architectural remains that were salvaged by the process referred in Section 4.2.4. - Complete reconstruction in compliance with the values and the characteristics of the original building (volume, spatial arrangement, morphology, material, structure, etc.), either as close as possible to the original building, or involving a reinterpretation of the original building. Furthermore, the guidelines also highlight that reconstruction should consider measures to increase the safety of the building in order to prevent similar damage situations in future earthquakes, as well as measures to ensure their energy efficiency and thermal comfort. According to the contents of these guidelines,	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale		http://www.beniculturali.it/mibac/multimedia/MiBAC/documents/feed/pdf/LINEE%20DI%20INDIRIZZO%20PER%20LA%20RICOSTRUZIONE%20POST%20SISMA-imported-75214.pdf	
UNESCO_b_130	CH	Guidelines for the preparation of a Disaster plan.	Guideline	No	Disaster preparedness and emergency response	Swiss government	country	building		1999		none	The objective of these guidelines is to make owners of cultural property aware that there are often hazards present in the building itself which are a threat both to the building and to the collections which it contains.	cultural		non-specific hazard		The guidelines are developed in the form of a checklist that can be adapted to different situations and that allow owners of cultural property to implement preparedness measures that will limit the consequences of damaging events. In addition, the Guidelines also have the objective of increasing the awareness of owners of cultural property regarding hazards that are likely to be present in the building itself and that are a threat both to the building and to the movable heritage that it may contain.	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://www.babs.admin.ch/en/aufgabenbabs/kgs/massnahmen.html	not a regulation
UNESCO_b_131	UK	Historic England Advisory Note on the Reconstruction of Heritage Assets. HO-J Draft 01042016.	Guideline	No	post-disaster reconstruction and recovery	Historic England	country	building		2016		none	The proposed document addresses the issue of cultural heritage reconstruction following disasters, considering the contents of several international documents and charters to frame the discussion	cultural		non-specific hazard		by the draft Advisory Note are presented in the following: - There should be a sufficiently good record of the asset prior to damage or destruction to enable accurate reconstruction rather than speculative recreation. - The relative significance of the elements proposed for reconstruction should be fully understood and, if reconstruction will cause harm to surviving fabric and/or archaeological remains, the significance of the whole and of the elements that would be restored should decisively outweigh the significance of those that would be lost. - It should be possible to distinguish the reconstructed elements from any physical fabric and/or archaeological remains that have survived from before the damage occurred or, if destruction is total, to make clear that the asset is a reconstruction. Such a distinction should usually be made discreetly and subtly	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale		https://historicengland.org.uk/about/what-we-do/consultations/guidance-open-for-consultation/closed-guidance-consultations/	not a regulation
UNESCO_b_132	ES	Plan Director para la recuperación del patrimonio cultural de Lorca.	Master Plan		post-disaster reconstruction and recovery	Spanish government	country	multiscope	sites, buildings, settlements, cities	2011		+/- 50M€	Legal framework for the recovery of the Cultural Heritage of Lorca after the 2011 earthquake	multiscope	cultural, social, economic, environmental	earthquakes		Repair/reconstruction works for the damaged cultural heritage. Auxiliary Programmes: development of a database to document and collect all the relevant data on the repair actions that were performed; dissemination actions of the heritage recovery process throughout its development across different media; special publications targeting different sectors of the local population on topics related to the effects of the earthquake and to the heritage recovery operations; exhibitions related to the recovery and repair processes, workshops discussing these processes with invited talks and practical in-situ demonstrations, and guided tours to sites of heritage assets being repaired.	A management commission promoted the recovery and the preventive maintenance/conservation of Lorca's cultural heritage, and was in charge of managing resources and funding for these operations.	Rapid implementation of the recovery actions for the culturl heritage of Lorca. Engagement of the citizens with their cultural heritage during the recovery and to involve them with the recovery process.	cannot be implemented before an event		high	QA - specific hazards and building/site scale		https://www.boe.es/eli/es/res/2011/10/28/(2)/dof/spa/pdf	
UNESCO_b_133	CH	Stratégie en matière de protection du patrimoine culturel en danger 2019 – 2023.	Strategy/policy	No	post-disaster reconstruction and recovery	Swiss government	country	multiscope	sites, buildings, settlements, cities	2019		none	The objective is to foster synergies within the federal government and to provide international partners with expertise and support in fields related to cultural heritage protection where Switzerland has experience.	cultural		non-specific hazard		The document establishes the following priorities: (1) establish Switzerland as a model with respect to the protection of endangered heritage, (2) provide the international community with Switzerland's knowledge and expertise in the field of cultural heritage protection, (3) engage in international forums for the protection of endangered cultural heritage. These priorities are broken down into objectives and measures that will be implemented through a detailed action plan.	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/site scale		https://www.admin.ch/gov/fr/accueil/documentation/communiques/communiques-conseil-federal.msg-id-74245.html	
UNESCO_b_134	European	Lisbon Treaty	International agreement	Yes	(relevant to) risk management	European Commission	cross-regional	multiscope	sites, buildings, settlements, cities	2007	/	none	International agreement that forms the constitutional basis of the European Union	multiscope	cultural; social; economic; environmental	non-specific hazard	/	The document refers the need for the EU to ensure the safeguarding of cultural heritage of European significance.	none	unknown	none	funds, unknown	low	QD - non-specific hazards and urban/territorial scale	/	https://www.coe.int/en/web/herein-system/european-union	/
UNESCO_b_135	European	European Landscape convention (ETS No. 176, Florence 2000)	Convention	No	(relevant to) risk management	Council of Europe	cross-regional	multiscope	sites, buildings, settlements, cities	2000	/	none	The Convention aims to promote landscape protection, management and planning, and to organise European co-operation on landscape issues	multiscope	cultural; social; economic; environmental	non-specific hazard	/	The document undertakes to: - to recognise landscapes in law as an essential component of people's surroundings, an expression of the diversity of their shared cultural and natural heritage, and a foundation of their identity; - to establish and implement landscape policies aimed at landscape protection, management and planning through the adoption of the specific measures set out in Article 6; - to establish procedures for the participation of the general public, local and regional authorities, and other parties with an interest in the definition and implementation of the landscape policies mentioned in paragraph b	none	unknown	none	funds, unknown	medium	QD - non-specific hazards and urban/territorial scale	/	https://www.coe.int/en/web/herein-system/council-of-europe	/

UNESCO_b_136	European	Framework Convention on the value of Cultural Heritage for Society (ETS No. 199, Faro, 2005)	Convention	No	(relevant to) risk management	Council of Europe	cross-regional	multiscope	sites, buildings, settlements, cities	2000	/	none	that knowledge and use of heritage form part of the citizen's right to participate in cultural life as defined in the Universal Declaration of Human Rights. The text presents heritage both as a resource for human development, the enhancement of cultural diversity and the promotion of intercultural dialogue, and as part of an economic development model based on the principles of sustainable resource use.	multiscope	cultural; social; economic; environmental	non-specific hazard	/	- recognise the public interest associated with elements of the cultural heritage in accordance with their importance to society; - enhance the value of the cultural heritage through its identification, study, interpretation, protection, conservation and presentation; - foster an economic and social climate which supports participation in cultural heritage activities; - promote cultural heritage protection as a central factor in the mutually supporting objectives of sustainable development, cultural	none	unknown	none	funds, unknown	medium	QD - non-specific hazards and urban/territorial scale	/	https://www.coe.int/en/web/herein-system/council-of-europe	/
UNESCO_b_137	European	Namur Declaration adopted at the 6th ministerial conference of Ministers responsible for Cultural Heritage in 2015 [	Declaration	No	(relevant to) risk management	Council of Europe	cross-regional	multiscope		2000	/	none	Establishes a strategy for redefining the place and role of cultural heritage in Europe	multiscope	cultural; environmental	non-specific hazard	/	The document refers the need to perform risk assessments or to establish adequate risk management strategies, namely by developing partnerships between UNESCO, the European Union and ICCROM	none	unknown	none	funds, unknown	medium	QD - non-specific hazards and urban/territorial scale	/	https://www.coe.int/en/web/herein-system/council-of-europe	/
UNESCO_b_138	European	Recommendation No. R (93) 9 on the protection of the architectural heritage against natural disasters	Recommendation	No	(relevant to) risk management	Council of Europe	cross-regional	multiscope		2000	/	none	Guidance on how to address several DRM aspects in the case of cultural heritage	cultural		non-specific hazard	/	The document provides detailed guidance on developing risk assessments for multiple hazards, disaster prevention plans and risk awareness training	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/site scale	/	https://www.coe.int/en/web/herein-system/council-of-europe	/
UNESCO_b_139	International	Venice Charter for the Conservation and Restoration of Monuments and Sites	Guideline	No	post-disaster reconstruction and recovery	ICOMOS	cross-regional	multiscope	buidings, sites	1964	/	none	Guidelines that provide an international framework for the conservation and restoration of historic buildings	cultural		non-specific hazard	/	The concept of historic monuments and sites was interpreted as the common heritage, therefore safeguarding them for the future generations with authenticity was defined as the common responsibility	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/district scale	/	https://www.icomos.org/charters/venice_e.pdf	not a regulation
UNESCO_b_140	International	Nara Document on Authenticity	Guideline	No	post-disaster reconstruction and recovery	ICOMOS	cross-regional	multiscope	buidings, sites	1994	/	none	Document that addresses the need for a broader understanding of cultural diversity and cultural heritage in relation to conservation in order to evaluate the value and authenticity of cultural property more objectively	multiscope	cultural; social; economic; environmental	non-specific hazard	/	The document clarifies the authenticity-related issues which were expressed in the articles 6 and 7 of the Venice Charter. The document produced a broader framework to analyse authenticity and assist practical decision-making in cultural heritage conservation. In particular, the document highlights that, when authenticity issues are being assessed for a particular cultural heritage asset, the underlying cultural context should be considered also	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/district scale	/	https://whc.unesco.org/uploads/events/documents/event-833-3.pdf	not a regulation
UNESCO_b_141	International	Convention for the Safeguarding of the Intangible Cultural Heritage	Convention	No	(relevant to) risk management	UNESCO	cross-regional			2003		none	The objectives of the Conventiona are to: - to safeguard the intangible cultural heritage; - to ensure respect for the intangible cultural heritage of the communities, groups and individuals concerned; - to raise awareness at the local, national and international levels of the importance of the intangible cultural heritage, and of ensuring mutual appreciation thereof; - to provide for international cooperation and assistance.	multiscope	cultural; social; economic; environmental	non-specific hazard	/	The Convention works on both national and international levels. At the national level, State Parties are supposed to take necessary measures to ensure the safeguarding of the intangible cultural heritage present in its territory. These measures include identification of the intangible cultural heritage that exists in its territory, adoption of appropriate policies, promotion of education. Besides these measures, each state parties must ensure the widest possible participation of communities, groups, and, where appropriate, individuals that create, maintain and transmit such heritage, and to involve them actively in its management. At the international level, this Convention promotes international cooperation, which includes the exchange of information and experience, joint initiatives, and the establishment of a mechanism of assistance to other State Parties.	none	unknown	none	funds, unknown	medium			http://portal.unesco.org/en/ev.php-URL_ID=17716&URL_DO=DO_TOPIC&URL_SECTION=201.html	
UNESCO_b_142	Turkey	Law on the Renovation and Preservation of Degraded Historical and Cultural Immovable Assets (Yipranan Tarihi ve Kültürel Taşınmaz Varlıkların Yenilenerek Korunması Ve Yaşatılarak Kullanılması Hakkında Kanun)	National Law	Yes	(relevant to) risk management	Turkish government	country	multiscope	buidings, sites	2005	/	none	The objective of this Law is to ensure that cultural heritage sites and other conservation areas that are degraded, damaged and on the verge of losing their specificity are reconstructed and restored by governmental institutions in harmony with regional development activities.	multiscope	cultural; social; economic	non-specific hazard	/	Among several issues to be considered, reference is made to the need to account for natural hazards and disaster risks.	none	unknown	none	funds, unknown	low	QC - non-specific hazards and building/district scale	/	https://www.mevzuat.gov.tr/MevzuatMetin/1.5.5366.pdf https://en.unesco.org/sites/default/files/turkey_lawconservationrenovationrevitalizationdeteriorateedhistoricalculturalimmovableproperty_2_entof	
UNESCO_b_143	Turkey	Preparation, Demonstration, Implementation, Inspection, and Principles and Procedures Regarding the Authors of Development Zoning Plans and Environmental Design Projects (Koruma Amaçlı İmar Planları ve Çevre Düzenleme Projelerinin Hazırlanması, Gösterimi, Uygulaması, Denetimi, Müelliflerine	National Law	Yes	(relevant to) risk management	Turkish government	country	multiscope	buidings, sites	2005	/	none	This standard covers the technical and management principles that need to be followed when preparing development plans for different types of interventions (conservation, protection, reconstruction, etc) that involve cultural heritage.	multiscope	cultural; social; economic; environmental	non-specific hazard	/	Among several issues to be considered, reference is made to the need to account for the safety of cultural heritage to different hazards (earthquakes, floods, landslides, fire, rock falls, and others that may be relevant).	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/district scale	/	http://teftis.kultururizm.gov.tr/TR-14430/koruma-amacli-imar-planlari-ve-cevre-duzenleme-projeler.html	

UNESCO_b_144	Turkey	Regarding the Procedures and Principles to be Followed in Arrangement, Restoration and Conservation Projects and Applications to be Made in Archaeological Excavations and Excavation Areas (Arkeolojik Kazılarda ve Kazı Alanlarında Yapılacak Düzenleme, Restorasyon ve Konservasyon Proje ve	National Law	Yes	risk management	Turkish government	country	multiscope	buildings, sites	2005	/	none	This standard establishes the procedures and principles that should be followed in the protection, conservation and restoration of archaeological areas.	cultural		non-specific hazard	/	Among other aspects, the standard refers the need to consider urgent measures are taken to prevent the destruction of the remains that may be vulnerable to natural hazards due to excavations. It also refers that, for developing adequate maintenance procedures, risk maps should be developed to identify existing threats.	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/district scale	/	http://teftis.kulturturizm.gov.tr/TR-14728/arkeolojik-kazilarda-ve-kazi-alanlarinda-yapilacak-duze-.html	
UNESCO_b_145	Turkey	Regulation on the Establishment, Permit, Working Procedures and Principles of Protection, Implementation and Inspection Offices, Project Offices and Training Units (Koruma, Uygulama ve Denetim Büroları, Proje Büroları ile Eğitim Birimlerinin Kuruluş, İzin, Çalışma Usul ve Esaslarına Dair Yönetmelik)	National Law	Yes	post-disaster reconstruction and recovery	Turkish government	country	building		2005	/	none	The regulation defines the type of interventions that are permitted to ensure the preservation of the values of the cultural heritage.	cultural		non-specific hazard	/	Among other aspects, this regulation covers the procedures and principles that should be followed to implement the repair of immovable cultural assets under the administration of the Directorate General of Foundations.	none	unknown	none	funds, unknown	medium	QC - non-specific hazards and building/district scale	/	http://www.resmigazete.gov.tr/eskiler/2005/06/20050611-7.htm	
UNESCO_b_146	Turkey	Regulation for fire protection of buildings	National Law	Yes	risk management	Turkish government	country	building		2007	/	none	Defines the procedures and solutions that need to be implemented in new and existing buildings to comply with fire safety	cultural		other hazards	Urban fire	With respect to cultural heritage, it only refers that such buildings need to be protected and the opinion of the Board of Protection of the Cultural and Natural Assets Protection needs to be considered when defining installations and equipment addressing the fire safety of the building, in order to implement them in a way that will not impact the values of the building.	none	unknown	none	funds, unknown	high	QA - specific hazards and building/district scale	/	http://www.resmigazete.gov.tr/eskiler/2007/12/20071219-2.htm	
UNESCO_b_147	Turkey	Amendment to the Regulation for fire protection of buildings	National Law	Yes	risk management	Turkish government	country	building		2009	/	none	Corrects some of the procedures and solutions that need to be implemented in new and existing buildings to comply with fire safety	cultural		other hazards	Urban fire	With respect to cultural heritage, it only refers that such buildings need to be protected and the opinion of the Board of Protection of the Cultural and Natural Assets Protection needs to be considered when defining installations and equipment addressing the fire safety of the building, in order to implement them in a way that will not impact the values of the building. Additional rules are also defined for certain types of historical buildings that somehow relax some of the conditions enforced for new buildings.	none	unknown	none	funds, unknown	high	QA - specific hazards and building/district scale	/	https://www.resmigazete.gov.tr/eskiler/2009/09/20090909-10.htm	
UNESCO_b_148	Turkey	of the High Council of Protection of Cultural Assets for Registered Immovable Cultural Property Damaged in the Earthquake and the Practices to be Carried Out in the Sites and Interaction-Transition Areas (Depremde Hasar Gören Tescilli Taşınmaz Kültür Varlıkları ile Sit Alanları ve Etkileşim-Geçiş Sahalarındaki	National Law	Yes	post-disaster reconstruction and recovery	Turkish government	country	multiscope	buildings, sites	2012	/	none	Defines procedures for the assessment and repair of cultural heritage damaged by earthquakes	cultural		earthquakes	/	The regulation refers that in, case of an earthquake, cultural heritage that is damaged should be assessed by the relevant Preservation Regional Board (KUDEB). The type of repair intervention is also defined by the Preservation Regional Board	none	unknown	none	funds, unknown	high	QA - specific hazards and building/district scale	/	http://teftis.kulturturizm.gov.tr/TR-45464/35-nolu-ilke-karari-depremde-hasar-goren-tescilli-tasin-.html	
UNESCO_b_149	Turkey	National Earthquake Strategy and Action Plan 2012-2023, Second Edition with Corrections	Strategy/policy	Yes	risk management	Disaster and Emergency Management Department (AFAD), Turkish government	country	multiscope	sites, buildings, settlements	2013	/	none	The document aims to reduce the earthquake risk and enable a society that is prepared against this form of hazard through examining the institutional framework for this objective and establish the priorities of the research and development programs on the subject. The strategy document is formed along three principal themes, seven objectives, 29 strategies and 87 action items for which 13 responsible agencies have been designated for implementing the cooperative work.	cultural		earthquakes	/	from earthquakes, the document refers the following actions and strategies: Determination of the international rules and design and manufacturing principles that should be followed in repair and strengthening applications, determining the earthquake safety and strengthening of the structures that do not have adequate security, inventory of existing historical structures consisting of a large part of masonry, wood or a mixture thereof, is required. Strategy B.2.1. Technical information on the determination and strengthening of earthquake safety of historical buildings will be developed and expanded. Action B.2.1.1. By taking inventory of historical buildings in earthquake regions, their importance and priority will be determined. In order to protect historical buildings from earthquakes, firstly, inventory of these structures should be taken throughout the	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/district scale	/	https://deprem.afad.gov.tr/download Document?id=1643	

UNESCO_b_150	Turkey	Turkey National Disaster Response Plan	Plan	Yes	Disaster preparedness and emergency response	Disaster and Emergency Management Department (AFAD), Turkish government	country	multiscope	sites, buildings, settlements	2014	/	none	The Turkey National Disaster Response Plan outlines the roles and responsibilities for every involving party in disaster and emergency response situations to determine the basic principles of response plan in all three phases: before, during and after the disaster and emergency situations.	multiscope	cultural; social; economic; environmental	non-specific hazard	/	Regarding the protection of cultural heritage the following measures are included: - To ensure that cultural assets are taken under security and protection. - To evacuate movable national wealth, valuable documents, items and animal when necessary. - To provide transportation of cultural assets. Regarding post-disaster loss assessment, the plan also refers th ened to determine the financial and economic dimension of disasters and emergencies across all sectors (which should also encompass cultural heritage)	none	unknown	none	funds, unknown	high	QC - non-specific hazards and building/district scale	/	https://ailevecalisma.gov.tr/uploads/athgm/uploads/page/goc-afet-ve-acil-durumlarda-psikososyal-destek/tamp.pdf	
UNESCO_b_151	NL	none	/			/		/		/	/	/	/		/		/	/	/	/	/	/			/	/	/	
UNESCO_b_152	BIH	none	/			/		/		/	/	/	/		/		/	/	/	/	/	/			/	/	/	/
UNESCO_b_153	SRB	none	/			/		/		/	/	/	/		/		/	/	/	/	/	/			/	/	/	
UNESCO_b_154	MNE	none	/			/		/		/	/	/	/		/		/	/	/	/	/	/			/	/	/	
~~UNESCO_b_155~~	~~SI~~	~~Cultural Heritage Protection Act of the Official Gazette of the Republic of Slovenia 16/2008 of 15 February 2008~~				~~Republic of Slovenia~~				~~2008~~																		
UNESCO_b_156	HR	none																										

Table B – Inputs from OL coordinators to overcome the gaps resulting from the desk research.

COUNTRY	NAME OF THE DOCUMENT	Type of document (policy, framework, regulation, strategy, manual, guideline, resolution, methodology, protocol, study, report, etc.)	Legally-binding document?	Topic of the document (i.e. DRM, DRM-CCA, disaster preparedness and emergency response; post disaster reconstruction and recovery)	promoter(s)	Document scale*	Document scope	If multiscope please specify	In force since	comment
Albania	Law No. 27/2018 Për trashëgiminë kulturore dhe muzetë On cultural heritage and museums, Fletorja Zyrtare, Viti 2018, Numri 86, Republic of Albania	National Law	Yes	risk management	Albanian Government	country	multiscope	building, site	2018	
Albania	Using traditional water cisterns to fight fire: A pilot project in two historical cities.	Pilot project	No	emergency preparedness	CHwB - Cultural Heritage without Borders Albania.	city	building		2017	
Bosnia and Herzegovina	General Framework Agreement for Peace in Bosnia and Herzegovina (Dayton Peace Agreement), Annex 8 – Agreement on the Commission to Preserve National Monuments, 1995	National Law	Yes			country			1995	As general comment the document from Bosnia and Herzegovina mostly address cultural heritage protection in war scenarios and some of them are older than the documents took in account in the desktop analysis
Bosnia and Herzegovina	Decision of the Presidency of Bosnia and Herzegovina on the Commission to Preserve National Monuments, 2001 ("Official Gazette of Bosnia and Herzegovina" no. 1/02 and 10/02)	National Law	Yes			country			2001	
Bosnia and Herzegovina	Rulebook on the activities of the Commission to Preserve National Monuments in terms of international cooperation, 2002 ("Official Gazette of Bosnia and Herzegovina", no. 29/02)	Rulebook				country			2002	
Bosnia and Herzegovina	Criteria for declaring a property a national monument, 2002/2003. ("Official Gazette of Bosnia and Herzegovina", no. 33/02 and 15/03; "Official Gazette of the Federation of Bosnia and Herzegovina" [FBiH], no. 59/02; "Official Gazette of Republika Srpska" [RS], no. 79/02)	Regulation				country			2002	

Bosnia and Herzegovina	Law on Implementation of the Decisions of the Commission to Preserve National Monuments, established pursuant to Annex 8 of the Dayton Agreement 2002, adopted by the Parliament of the Federation of Bosnia and Herzegovina ("Official Gazette of the Federation of Bosnia and Herzegovina", no. 2/02 and 27/02, 6/04, 51/07)	National/entity Law	Yes			entity			2002	
Bosnia and Herzegovina	Law on Implementation of the Decisions of the Commission to Preserve National Monuments, established pursuant to Annex 8 of the Dayton Agreement, 2002, adopted by the Parliament of Republika Srpska ("Official Gazette of Republika Srpska" no. 9/02, 70/06 and 64/08)	National/entity Law	Yes			entity			2002	
Bosnia and Herzegovina	Law on the Protection and Preservation of Cultural, Historical and Natural Heritage of 1985, amended in 1987, 1993 and 1994, applied and implemented in the cantons that do not have their own laws: Posavina Canton, Tuzla Canton, Bosnia-Podrinje Canton, Central Bosnia Canton and Canton 10	National/entity Law	Yes			entity/canton			1985	
Bosnia and Herzegovina	Canton Sarajevo: Law on the Protection of Cultural Heritage ("Official Gazette of the SC", no. 2/00)	National/ canton Law	Yes			canton			2000	
Bosnia and Herzegovina	Western Herzegovina Canton: Law on the Protection and Use of Cultural, Historical and Natural Heritage ("Official Gazette of the WHC", no. 6/99)	National/ canton Law	Yes			canton			1999	
Bosnia and Herzegovina	Zenica-Doboj Canton: Law on the Protection of Cultural Heritage ("Official Gazette of the ZDC", no. 2/00)	National/ canton Law	Yes			canton			2000	
Bosnia and Herzegovina	Herzegovina–Neretva Canton: Law on the Protection of Cultural and Historical Heritage in the Herzegovina–Neretva Canton (HNC) ("Official Gazette of the HNC", no. 2/06) and the Law on authorising construction works outside the national monument boundaries or provisional boundaries and implementation of protection measures ("Official Gazette of the HNC", no. 5/08)	National/ canton Law	Yes			canton			2008	

Bosnia and Herzegovina	Okvirni zakon o zaštiti i spašavanju ljudi i materijalnih dobara od prirodnih ili drugih nesreća u Bosne i Hercegovini (Službeni glasnik 50/08)	National Law	Yes	risk management	Council of Ministers of Bosnia and Herzegovina	country			2008	
Bosnia and Herzegovina	Law on Cultural Property, 1995. ("Official Gazette of Republika Srpska" no. 11/95) and Law on Amendments to the Law on Cultural Property ("Official Gazette of Republika Srpska" no. 103/08)	National/entity Law	Yes			entity			1995	
Bosnia and Herzegovina	Law on Protection and Rescue of FBiH ("Official Gazette of FBiH" No. 39/03, 22 / 06 and 43/10),	National Law	Yes		Government of the Federation of Bosnia and Herzegovina	entity			2003	
Bosnia and Herzegovina	Law on Spatial Planning and Land Use in the Federation of Bosnia and Herzegovina, ("Official Gazette of the Federation of Bosnia and Herzegovina", no. 2/05 and 72/07);	National/entity Law	Yes			entity			2005	
Bosnia and Herzegovina	Law on Protection and Rescue of the RS (Official Gazette of RS No. 121/12 and 46/17)	National Law	Yes		Government of the Republika Srpska of Bosnia and Herzegovina	entity			2012	
Bosnia and Herzegovina	Law on Spatial Planning and Construction ("Official Gazette of the Republika Srpska", no. 40/13)	National/entity Law	Yes			entity			2013	
Bosnia and Herzegovina	Law on Spatial Development – Consolidated text ("Official Gazette of Republika Srpska" no. 84/02, 55/02, 14/03, 112/06, 53/07);	National/entity Law	Yes			entity			2002	
Bosnia and Herzegovina	Law on Spatial Development ("Official Gazette of the Brčko District" no. 9/03. 23/03, 15/04)	National/entity Law	Yes			entity/district			2003	
Bosnia and Herzegovina	Federal Operational Flood Defence Plan ("Official Gazette of the Federation BiH", 97/15)	Master Plan	Yes		Government of the Federation of Bosnia and Herzegovina	entity			1997	
Bosnia and Herzegovina	Regulation on the Federal Office for civil protection (Official Gazette of FBaH No. 54/03, 38/06, 74/07 and 63/11)	Regulation	Yes		Government of the Federation of Bosnia and Herzegovina	entity			2003	
Bosnia and Herzegovina	Rulebook on the manner of work and functioning of the Office and trustee for civil protection (Official Gazette of FBaH No. 77/06, 5/07 and 32/14)	Guideline	No			entity			2006	
Bosnia and Herzegovina	Regulation on the type, content, labelling and storage, control and	Regulation	Yes						2007	

	nostrification of investment and technical documentation ("Official Gazette of the Federation of BiH", nos. 88/07, 51/08);									
Bosnia and Herzegovina	Regulation on performing prior exploration works on national monuments ("Official Gazette of the Federation of BiH", no. 36/08	Regulation	Yes						2008	
Bosnia and Herzegovina	Regulation on construction and site arrangement, compulsory documentation on site and construction actors ("Official Gazette of the Federation of BiH", nos. 48/09 and 75/09)	Regulation	Yes						2009	
Bosnia and Herzegovina	Master Operational Flood Defense Plan of the RS	Master Plan	Yes		Government of the Republika Srpska of Bosnia and Herzegovina	entity			2016	
Bosnia and Herzegovina	Master Operational Flood Defence Plan of the Brčko District	Master Plan	Yes		Government of the Brčko District and Herzegovina	entity/district			2018	
Croatia	Law on Protection and Rescue Zakon o sustavu civilne zaštite, Official Gazette.No. 82/2015, 118/2018 i 31/2020	National Law	Yes	disaster preparedness and emergency response	Croatian Government	country	multiscope	building, site	2015	
Croatia	National Flood Defense Plan adopted by the Government of the Republic of Croatia (Official Gazette No. 84/10 of 2010)	Master Plan	Yes	disaster preparedness and emergency response	Croatian Government	country	multiscope	building, site	2010	
Croatia	Law on the Protection and Preservation of Cultural Property, Official Gazette No. 69/99,151/03,157/03, amendments 87/09, 88/10, 61/11,25/12, 157/13, 152/14, 44/17, 90/18, 32/20	National Law	Yes	Protection of cultural heritage related to DRR measures	Croatian Government	country	multiscope	protection, site	1999	
ES	PLATERGA: Territorial Plan for emergencies for Galicia - https://cpapx.xunta.gal/c/document_library/get_file?folderId=127859&name=DLFE-8406.pdf PLAN TERRITORIAL DE EMERGENCIAS DE GALICIA	Emergency management plan		DRM natural heritage	Xunta de Galicia	Regional	The fundamental objective of PLATERGA is to obtain maximum protection for people, the environment and the goods that could be affected in any emergency situation and plan the		2009	general emergency management plan focused

							actions in order to be able to give a quick and effective response to any of these emergencies in the territorial area of the Autonomous Community of Galicia, as a consequence of the risks identified in this plan. Fires are included in the plan.			on multihazards of natural Heritage
ES	PLAN ESPECIAL DE PROTECCIÓN CIVIL ANTE EMERXENCIAS POR INCENDIOS FORESTAIS NA COMUNIDADE AUTÓNOMA DE GALICIA (PEIFOGA)	Emergency management plan		disaster preparedness and emergency response	Consello da Xunta de Galicia	Regional	The purpose of this plan it is specific por the fires emergencies. All this with the maximum efficiency, in the situations of emergency by forest fires, in coherence with the principle that in such situations the protection of the life and the security of the people must prevail against any other value.		2015	general wildfires emergency management plan focused on natural Heritage
ES	Plan de prevención y defensa contra los incendios forestales de Galicia (PLADIGA)	Emergency management plan		disaster preparedness and emergency response	Xunta de Galicia	Regional	The Plan for prevention and defense against forest fires in Galicia (Pladiga) has been recently updated. The objective of the Plan is		2020	general wildfires emergency management plan focused on natural Heritage and NATURA 2000 network sites

							focused on reducing to the minimum possible the ecological, economic and social damages produced by the forest fires in the Galician Community, within the available resources and it allows the coordinatio between all the administration s departments.			
Montenegro	Law on Protection and Rescue	National Law	Yes	disaster preparedness and emergency response	Montenegrin Government	country			2007	
Montenegro	National Strategy for Emergency Situations	Strategy/policy	Yes		Montenegrin Government	country			2006	
Montenegro	Rulebook on the methodology for the preparation of study on threats and assessments of natural technical-technological disasters and other accidents	Guideline	No			country			2008	
Montenegro	Rulebook on Methodology for drafting plans for protection and rescue	Guideline	No						2008	
Montenegro	National Plan for Flood Protection and Rescue (updated in 2014)	Master Plan	Yes						2011	
NL	Dutch practical guidelines for earthquake proof construction (NPR 9998:2018),	guidance	no	Disaster preparedness (prevention)	NEN official dutch national norms institute	country	building		2018	General comment : not national binding guidelines specific in relation to CH, but some advisory guidelines. It is a standard.
NL	Assessment tool for water damages to monuments	guidance	no	Disaster preparedness and response	National institute for Cultural Heritage (RCE)	Country	Building , CH monument,		2015	General comment : not national binding guidelines specific in relation to CH, but some advisory guidelines. The document addresses mostly aspects related to movable heritage and collections (as typical of most Dutch documents on cultural

										heritage risk management), but there are a few things that are related to the building that holds that movable heritage.
NL	Using CH knowledge to analyse climate risks	Guidance	No	Disaster preparedness	National institute for Cultural Heritage (RCE)	Country	Building, CH monuments		2018	General comment : not national binding guidelines specific in relation to CH, but some advisory guidelines. The document does not address climate risk effects on cultural heritage. Instead, it refers that traditional and cultural knowledge is relevant to address climate risk challenges in cities, namely by using knowledge on old water systems to address these climate challenges. So it's not really about cultural heritage, it's more about traditional knowledge.
Serbia	Law on Emergency Situations ("RS Official Gazette", No. 111/09, 92/11 and 93/12)	National Law	Yes	disaster preparedness and emergency response	Serbian Government	country	multiscope	building, site	2009	document not specific on cultural heritage but relevant
Serbia	Regulation on the content and the manner of drafting plans for protection and rescue in emergency situations (Official Gazette RS No. 8/11)	Regulation	Yes	disaster preparedness and emergency response	Serbian Government	country	multiscope	building, site	2011	document not specific on cultural heritage but relevant
Serbia	Guidance on the methodology for making the vulnerability assessment for natural disasters and other accidents and protection and rescue plans in emergency situations (Official Gazette RS No. 18/17)	Guideline	No		Serbian Government	country			2017	document not specific on cultural heritage but relevant
Slovenia	Resolution on the National Program for the Protection against Natural and other Disasters for the Period 2016 to 2022; Resolucija o nacionalnem programu varstva pred naravnimi in drugimi nesrečami v letih od 2016 do 2022 (ReNPVNDN16-22)	Resolution	Yes	disaster preparedness and emergency response	Slovenian Parliament	country	Natural and other hazards.		2016	*National Program for Protection against Natural and Other Disasters – refers cultural heritage as one of the assets to protect. Refers the need to intensify preventive measures for cultural heritage. Refers that Education and training programs will be prepared, as well as seminars and workshops and other forms*

										of information, training and awareness-raising for the protection of cultural heritage in the event of natural and other disasters, including adaptation to climate change. All these activities will be aimed at cultural heritage protection experts (conservators, curators, restorers, etc.), owners, possessors and managers of cultural heritage, units and forces involved in the system of action in case of natural and other disasters (firefighters, Civil Protection, etc.), spatial planners, designers and other interested public. Refers the special needs of post-disaster damage assessment of cultural heritage
Slovenia	Protection Against Natural and Other Disasters Act; Zakon o varstvu pred naravnimi in drugimi nesrečami (Uradni list RS, št. 51/06 – uradno prečiščeno besedilo, 97/10 in 21/18 – ZNOrg)	National Law	Yes	disaster preparedness and emergency response	Slovenian Parliament	country	Natural and other hazards	Receptors: people, animals, property, cultural heritage, environment	2006	*Regulates the protection of people, animals, property, cultural heritage and the environment against natural and other disasters.* *Art. 39 refers that owners, managers or users of cultural heritage are responsible for the implementation of prescribed protection measures. They may request the assistance of a professional service for the protection of cultural heritage.* *Article 69 (protection of cultural heritage)* *(1) The protection of cultural heritage includes the preparation and implementation of measures for the reduction of dangers and the prevention and reduction of the harmful effects of*

										natural and other disasters on cultural heritage. *(2) The preparations and measures referred to in the preceding paragraph shall be carried out by the owners and users of cultural heritage, the professional service for the protection of cultural heritage, municipalities and the state. Relevant units and services of the Civil Protection, fire brigades and other forces for protection, rescue and assistance shall also participate in the implementation of the protection of cultural heritage in the event of natural and other disasters, if necessary.* *(3) The Government shall regulate in more detail the protection of cultural heritage in the event of natural and other disasters.*
Slovenia	Decree on the content and elaboration of protection and rescue plans; Uredba o vsebini in izdelavi načrtov zaščite in reševanja (Uradni list RS, št. 24/12, 78/16 in 26/19)	Regulation	Yes	disaster preparedness and emergency response	Slovenian Government	country	Natural and other hazards.	Receptors: people, animals, property, cultural heritage, environment	2012	document not specific on cultural heritage but relevant *Defines the planning bodies, content, criteria for the preparation and manner of preparation of plans for the protection and rescue of people, animals, property, cultural heritage and the environment in the event of natural and other disasters.*
Slovenia	National Environment Protection Programme with programmes of measures until 2030; Resolucija o Nacionalnem programu varstva okolja za obdobje 2020–2030 (Uradni list RS, št. 31/20)	Resolution	Yes	Environmental protection	Slovenian parliament	country	Environment	water, air soil	2020	document not specific on cultural heritage but relevant. *Defines the National Environmental Protection Program 2020-2030.* *Addresses the preservation of landscape features and cultural elements*
Slovenia	Water Act; Zakon o vodah (Uradni list RS, št. 67/02, 2/04 – ZZdrI-A, 41/04	National Law	Yes	Flood risk management	Slovenian parliament	country	*Water*	Receptors: people,	2002	Water

	– ZVO-1, 57/08, 57/12, 100/13, 40/14, 56/15 in 65/20)							environment, economic activity, cultural heritage		*This law regulates the management of the sea, inland and groundwater (hereinafter: water) and water and coastal land. Water management and water and coastal lands include water protection, water management and decision-making on water use. Article 91 (scope of protection against harmful effects of water) refers that the State shall take care of the protection of people, the environment, economic activities and cultural heritage from the harmful effects of water.*
Slovenia	Decree on establishement of flood risk management plans; Uredba o vsebini in načinu priprave podrobnejšega načrta zmanjševanja ogroženosti pred poplavami (Uradni list RS, št. 7/10)	Regulation	Yes	Flood risk management	Slovenian Government	country	Flood	Receptors: human health, environment, cultural heritage, economic activity	2010	document not specific on cultural heritage but relevant. *Regulates the content and manner of preparation of a more detailed flood risk reduction plans with the aim of reducing the harmful effects of floods on human health, the environment, cultural heritage and economic activities in areas of significant flood impact and associated erosion. Impacts to cultural heritage need to be included in those plans*
Slovenia	Decree on conditions and limitations for constructions and activities on flood risk areas; Uredba o pogojih in omejitvah za izvajanje dejavnosti in posegov v prostor na območjih, ogroženih zaradi poplav in z njimi povezane erozije celinskih voda in morja (Uradni list RS, št. 89/08 in 49/20)	Regulation	Yes	Flood risk management	Slovenian Government	country	Flood	Receptors: people, environment, economic activity, cultural heritage	2008	document not specific on cultural heritage but relevant. *Regulates the conditions and restrictions for carrying out activities and spatial interventions in areas prone to floods and associated inland and sea erosion. These conditions and restrictions aim at reducing flood and erosion risks of the population, economic activities and cultural heritage*

Slovenia	Rules on methodology to define flood risk areas and erosion areas connected to floods and classification of plots into risk classes; Pravilnik o metodologiji za določanje območij, ogroženih zaradi poplav in z njimi povezane erozije celinskih voda in morja, ter o načinu razvrščanja zemljišč v razrede ogroženosti (Uradni list RS, št. 60/07)	Regulation, Methodology	Yes	Flood risk management	Ministry of environment and spatial planning, Ministry of defence	country	flood	Receptors: people, environment, economic and non-economic activity, cultural heritage	2007	document not specific on cultural heritage but relevant. Defines the methodology for determining flood risk areas and associated inland and sea erosion, and on how land is to be classified as endangered. Risk includes impacts to cultural heritage.
Turkey	Earthquake Regulation for Buildings (Türkiye Bina Deprem Yönetmeliği)	National Law	Yes	post-disaster reconstruction and recovery (on structural calculations and earthquake risk areas)	Turkish government	conuntry	buildings	buildings	2018	It is a national standard for earthquake design of new buildings and retrofit/strengthening of existing buildings. This standard explicitly says, in Section 1.1.8, that assessing the earthquake safety of listed buildings and monuments of historical and cultural value (and providing procedures to strengthen them) is beyond the scope of the standard. The only thing that might be relevant is the earthquake zonation, but this is not a heritage-specific aspect.
Turkey	Earthquake and Emergency Response Regulation (Afet Ve Acil Durum Müdahale Hizmetleri Yönetmeliği)	National Law	Yes	Response	Turkish Government	Conuntry	Multiscope	sites, buildings, settlements	2013	

10.2 Annex II – Good practices data collection sheet

Complete Excel file available here.

	EU PROJECT INFO					GOOD PRACTICE (GP) CONTENTS														GP IMPLEMENTATION					GENERAL FIELDS				
PROPOSEDIT CODE	EU project acronym	Project title	Funding programme	Project timeframe	practice relation with the project	Practice Name	necessary conditions for the application (e.g. resources, targeted policies, etc.)	barriers/obstacles in application (e.g. funds availability, public acceptability, etc.)	GP Brief description	keyfactors/ main objectives	main actions/ measures	practice targeted to: (S,R, ERM), resilience, security, etc.	GP scale*	if 'multiscale' please specify which ones among those mentioned beside	addressed hazard*	if 'multihazard' please specify which ones among those mentioned beside if 'other hazards', please add the description of the other hazards addressed	GP scope*	if 'multiscope', please specify which ones among those mentioned beside	information on the monitoring system available	if related to (a) specific location(s) specify which ones	timeframe*	date of GP*	budget allocated (€ any - amount, JC and source	main results/evidence after the application of the practice (already implemented and demonstrated)	relevance to DIKTEP*	qualities*	hazard(s)	references (websites, publications, etc.)	comments
UNESCO_d_001	ProtecCHEJsave	RISK ASSESSMENT AND SUSTAINABLE PROTECTION OF CULTURAL HERITAGE IN CHANGING ENVIRONMENT	Interreg Central Europe	01/07/2017-30/06/2020	collected and classified by the project	use of physical and mathematical models to understand the hazard and the hydrogeological and natural processes	availability of detailed information and well-documented data	funds availability, skilled staff	Physical models and mathematical models (i.e. of a river basin) are used to study the behaviour of floods and to assess the effectiveness of proposed structural measures	to study the behaviour of floods; to help assessing the effectiveness of proposed structural measures	building of a river basin model; elaboration of mathematical model of behaviour in case of flooding; study of the processes through simulations	DRM; security; planning measures	multiscale	district; city; region	floods		multiscope	cultural; environmental; economic	no	Prague - Troja, CZ	already implemented	not totally documented but promising and inspiring	n.a	n.a	high	CZ - specific hazards and urban/territorial scale	physical model; mathematical model; risk assessment; floods behavior	https://www.interreg-central.eu/Content.Node/K-T-1-1-1-Manual-of-good-and-best-practices.pdf	
UNESCO_d_002	MORDIS project	MORDIS project	Ministry of Culture of the Czech Republic	2011-2015	developed and put into practice by the project	Damage identification using mobile devices (i.e. MORDIS mobile app)	consolidation of the mobile app (i.e. MORDIS app); availability of a proper mobile device	use of the app just within the territorial boundaries covered by it; possible need of a licence or the payment	The mapping and identification of the CH assets at risk can be done through modern ICT solutions, able to easily record and process a set amount of data in the field of risk evaluation and management	to map the CH assets at risk; to develop a digital database of CH at risk	use of the app to identified the damages; use of the app to feed the assets at risk database	DRM	multiscale	building; district; city	non-specific hazard		multiscope	cultural; social; economic	no	Czech Republic	already implemented	not totally documented but promising and inspiring	n.a	n.a	high	CZ - non-specific hazards and building/district scale	damage identification, mobile devices, cultural heritage, risk evaluation	https://www.interreg-central.eu/Content.Node/K-T-1-1-1-Manual-of-good-and-best-practices.pdf	
UNESCO_d_003	ProtecCHEJsave	RISK ASSESSMENT AND SUSTAINABLE PROTECTION OF CULTURAL HERITAGE IN CHANGING ENVIRONMENT	Interreg Central Europe	01/07/2017-30/06/2020	collected and classified by the project	Design and implementation of adequate drainage systems	availability of detailed data on water behaviour; information about the building/area	Funds availability; skilled staff; necessity of maintenance of the system	Drain pits have been added to the drainage system in order to stop the flooding of water downhill. In fact, the existing should be surveyed and repaired on a periodic basis. New systems, or parts of them, should be carefully designed to allow for the increased rain loads, in case the existing system is deemed not sufficient.	to stop the flooding of water downhill and improve the efficiency of the drainage system	addition of drain pits	DRM; CCA	multiscale	building; district; city	storms		multiscope	cultural; environmental		Pécs, Hungary	already implemented	not totally documented but promising and inspiring	n.a	n.a	medium	CH - specific hazards and building/district scale	drainage systems, storms, heavy rain, water flooding	https://www.interreg-central.eu/Content.Node/K-T-1-1-1-Manual-of-good-and-best-practices.pdf	
UNESCO_d_004	ProtecCHEJsave	RISK ASSESSMENT AND SUSTAINABLE PROTECTION OF CULTURAL HERITAGE IN CHANGING ENVIRONMENT	Interreg Central Europe	01/07/2017-30/06/2021	collected and classified by the project	Implementation of automatic fire-fighting systems	availability of detailed data on the building and its structural behaviour in case of fire	Funds availability; skilled staff; necessity of a constant maintenance of the device	Automatic fire-fighting systems should be installed whenever possible if it can be proven that the risk could be reduced, but only where there is likely to be little or no impact on the special interest of the historic buildings.	to reduce the risk of fires; to minimize the impact; to ensure that the necessary level of safety is provided.	installation of automatic fire-fighting systems (i.e. devices on roof ridges or on cornices, dry pribler systems, copper pipes with hidden points, etc.)	DRM; security	building		wildfire		multiscope	cultural; economic	no	not specified					low	CH - specific hazards and building/district scale	fires, automatic fire-fighting systems, risk reduction	https://www.interreg-central.eu/Content.Node/K-T-1-1-1-Manual-of-good-and-best-practices.pdf	
UNESCO_d_005	ProtecCHEJsave	RISK ASSESSMENT AND SUSTAINABLE PROTECTION OF CULTURAL HERITAGE IN CHANGING ENVIRONMENT	Interreg Central Europe	01/07/2017-30/06/2021	collected and classified by the project	Investigation of the performance of building components/interventions against excessive rain penetration	availability of detailed data on water behaviour; information about the building structure and materials; use of physical or digital simulations	funds availability; skilled staff; availability of simulation programs and/or laboratories and technology to make tests	investigating the performance of original or altered building materials and components, such as wall assemblies, undergoing heavy rain situations and the combination with other environmental and intrinsic factors (e.g. temperature, salts, damage to building component etc.)	to improve the resilience of cultural heritage assets against heavy rain; to investigate and evaluate the building performance and provide possible solutions	investigation of the performance of historical building components under strong rain loads; evaluation of the effectiveness of possible interventions (i.e. brick masonry testing of wind-driven rain)	DRM; efficiency	building		storms		multiscope	cultural; economic		Telč, Czech Republic	already implemented	not totally documented but promising and inspiring	n.a	n.a	medium	CH - specific hazards and building/district scale	heavy rain; components performance; rain penetration	https://www.interreg-central.eu/Content.Node/K-T-1-1-1-Manual-of-good-and-best-practices.pdf	
UNESCO_d_006	ProtecCHEJsave	RISK ASSESSMENT AND SUSTAINABLE PROTECTION OF CULTURAL HERITAGE IN CHANGING ENVIRONMENT	Interreg Central Europe	01/07/2017-30/06/2022	collected and classified by the project	Territorial protection through the use of barriers	opportunity to build the barriers in terms of available space; consents of the area; funds; time and permissions	opportunity to build the barriers in terms of available space; consents of the area; funds; time and permissions	Protection barriers can be very useful in preventing flooding of large areas along the river banks. It requires complex works and it is usually time-consuming and expensive, however it provides an increased level of safety and, under particular circumstances, it helps avoiding catastrophic losses.	to protect the areas close to the river banks from unexpected floods; to reduce the catastrophic losses	building of barriers along the river banks to prevent floods	CCA; DRM	multiscale	district; city; region	floods		multiscope	all		barrier along the Danube (Sofia, Bulgaria)	already implemented	not totally documented but promising and inspiring	n.a	n.a	medium	CH - specific hazards and urban/territorial scale	flooding, barriers on river banks, flood prevention	https://www.interreg-central.eu/Content.Node/K-T-1-1-1-Manual-of-good-and-best-practices.pdf	
UNESCO_d_007	HERACLES	Heritage Resilience Against Climate Events on Site	H2020	01/05/2016-30/04/2019	developed and put into practice by the project	Managing disaster events: coordination through the ICT platform (HERACLES platform)	availability of the ICT platform		The mapping and identification of the CH assets at risk can be done through modern ICT solutions, able to easily record and process a set amount of data in the field of risk evaluation and management	to map the CH assets at risk; to develop a digital database of CH at risk; to have ready guidelines to use in the case of disaster	use of the app to identified the damages; use of the app to feed the assets at risk database; use of guidelines to manage Disaster	DRM; planning measures	multiscale		non-specific hazard		multiscope	cultural; social; economic			already implemented	not totally documented but promising and inspiring	n.a	n.a	high	CZ - non-specific hazards and building/district scale			
UNESCO_d_008	STORM	Safeguarding Cultural Heritage through Technical and Organisational Resources Management	H2020	01/06/2016-31/01/2019	developed and put into practice by the project	Implement interdisciplinary DRM programmes at site level, beginning with the definition of a common Frame of Reference	necessity of a central and/or local- level frame of Reference	creating a single Fall articulating all the several voices participating in the DRM	Methodology and tool for authorities to define and promote the common framework and voice that should ultimately provide over heritage management decisions in each of the levels of governance that they cover: central, regional or local	to provide a common vision and guidelines on DRM	get all the several institutions participating the DRM in agreement	DRM; planning measures	multiscale	district; city; region	non-specific hazard		multiscope	cultural; social; economic		not specified	already implemented	not totally documented but promising and inspiring	n.a	n.a	high	CZ - non-specific hazards and urban/territorial scale	government; DRM; authorities; principles; conservation; policies	https://www.storm-project.eu/materials/ https://zenodo.org/search?q=storm%20project&sort=bestmatch	
UNESCO_d_009	STORM	Safeguarding Cultural Heritage through Technical and Organisational Resources Management	H2020	01/06/2016-31/01/2019	developed and put into practice by the project	Maintenance plan for conservation interventions	availability of detailed data on the CH and regular on-site monitoring	funds availability for regular monitoring; skilled staff	Set up guidelines for a maintenance plan that supports conservation interventions to provide to authorities and skilled staff. This should be based, as much as possible, on regular on-site monitoring, testing, and thorough documentation about the heritage site.	to provide a maintenance plan to implement current methods of managing CH site	scheduling operations and minimal interventions criteria	planning measures; resilience; security	multiscale	district; city; region	non-specific hazard		multiscope	cultural; economic	no	Baths of Diocletiana	already implemented	not totally documented but promising and inspiring	n.a	non-natural based maintenance treatments for stone and materials were implemented based on the monitoring outcomes.	high	CZ - non-specific hazards and building/district scale	maintenance; planning; conservation; guidelines; cultural heritage; monitoring	https://www.storm-project.eu/materials/ https://zenodo.org/search?q=storm%20project&sort=bestmatch	
UNESCO_d_010	STORM	Safeguarding Cultural Heritage through Technical and Organisational Resources Management	H2020	01/06/2016-31/01/2019	developed and put into practice by the project	Inclusion of emergency sector cooperation in national policies	agreements of cooperation among authorities and civil protection	national policies; skilled staff	Ensure that the cooperation between civil protection/emergency sector and cultural heritage sector is adequately developed in national policies	civil protection ready to handle disaster situations on the basis of common guidelines	managing disaster events with a pre-defined chain of command	DRM; security; efficiency	multiscale	district; city; region	non-specific hazard		multiscope	cultural; social; economic			already implemented	not totally documented but promising and inspiring	n.a		high	CZ - non-specific hazards and urban/territorial scale	guidelines; DRM; security; civil protection; policies	https://www.storm-project.eu/materials/ https://zenodo.org/search?q=storm%20project&sort=bestmatch	
UNESCO_d_011	STORM	Safeguarding Cultural Heritage through Technical and Organisational Resources Management	H2020	01/06/2016-31/01/2019	developed and put into practice by the project	Planning of drills for involved stakeholders	Testing schedule and guidelines on which to base drills	national policies; skilled staff	Promote the execution of drills since they are a key component for emergency plans, first aid actions on cultural heritage and assessment of the cooperation between the stakeholders involved.	preparedness for the real emergency event	establishing procedure and a chain of command	DRM; security; efficiency	multiscale	building; district; city	non-specific hazard		multiscope	cultural; social; economic	no	Roman Ruins of Troia	already implemented	already validated and demonstrated	n.a	improved collaboration among stakeholders; generation of guidelines for the local case study	medium	CZ - non-specific hazards and building/district scale	guidelines; DRM; security; civil protection; policies	https://www.storm-project.eu/materials/ https://zenodo.org/search?q=storm%20project&sort=bestmatch	
UNESCO_d_012	STORM	Safeguarding Cultural Heritage through Technical and Organisational Resources Management	H2020	01/06/2016-31/01/2019	developed and put into practice by the project	Use of digital tools and ICT platforms	Availability of common digital tools and platforms	funds availability; skilled staff	Encourage the use of digital tools to improve accuracy of data and to serve as a quintessential collaborative network, even in all phases of DRM.				multiscale	building; district; city	non-specific hazard										high	CZ - non-specific hazards and urban/territorial scale			
UNESCO_d_013	STORM	Safeguarding Cultural Heritage through Technical and Organisational Resources Management	H2020	01/06/2016-31/01/2019	developed and put into practice by the project	DRM training courses for professionals and non involved in CH management		funds availability; have guidelines	Organise DRM and Climate Change Adaptation training programs, designed to protect cultural heritage, for heritage professionals (Engineering, Conservation-Restoration, Architecture, Archaeology, Art History), heritage site managers, disaster managers, climatology experts, public or private administrators and local residents.	competence of people involved in the DRM process; preparedness for the real emergency event	organization of train courses	DRM; security; efficiency	multiscale	building; district; city	non-specific hazard		multiscope	cultural; social;	no	Project case studies	already implemented	already validated and demonstrated	n.a	Guidelines for forthcoming training courses	high	CZ - non-specific hazards and building/district scale	DRM; efficiency; training; preparedness; security; skilled staff	https://www.storm-project.eu/materials/ https://zenodo.org/search?q=storm%20project&sort=bestmatch	

SNAR1_d_C11	SNR	Smart Mature Resilience	ICLEI	01/06/2015 - 31/08/2018	developed and put into practice by the project	European Resilience Management Guideline through the tools	availability of the tools developed in the project or similar ts	tools availability (commercial guidelines are always available)	The European Resilience Management Guideline therefore defines an operational framework that provides guidance and aims at training and supporting municipalities and relevant stakeholders in implementing an integrated management process that enhances city resilience. Four tools are used in the process: 1. Resilience Maturity Model (RMM) 2. Risk Systemicity Questionnaire (RSQ) 3. Resilience Engagement Tool Kit: Resilience Information Portal (RIP) 4. City Resilience Dynamics Model (CRD) 5. Resilience Building Policies Tool (RBPT)	common operational framework to enhance city resilience, easy to use by the stakeholders	establishing procedures and long-term projects to enhance city resilience	urban resilience, security, efficiency, stakeholder management, ICT, social dynamics, critical infrastructure	city			earthquakes	multihazard	cultural, economic, social	no	Malmö (Sweden), Rotterdam (Netherlands), Birkenhead (Norway) and Glasgow (United Kingdom) - 1-3 warning cities	already implemented	already validated and demonstrated	n.a.	improved capacities of trained stakeholders; improved skills on urban governance, foresight and strategy development	high	LB - specific hazards and urban/territorial scale	efficiency training, operational guidelines, stakeholders, urban resilience planning, preparedness, skilled staff, tools for preparedness	https://www.resilientcities.net/	interesting in particular Resilience Security Model (RSM), earthquake control but applicable to other hazards
SNAR1_d_C12	Flood Profile	Technologies for Flood Protection of the Built Environment	FFT	01/11/2009 - 31/10/2012	developed and put into practice by the project	Guidance on improving performance of urban flood defences	availability of detailed data on soil	opportunity to build the barriers in times of available space; property of the area; funds; time and permissions	new methodologies and tools for assessing the reliability of flood defence systems	assessing the reliability of flood defence systems	assessing creative process, rapid and cost-effective methods to deal with large-lengths of heterogeneous issues and submit tools to improve the levee assessment	security; preparedness; urban resilience; CCA	multihazard	city, regional	floods		multihazard	environmental, social, economic	yes	Ottawa (Canada), Hamilton (UK)	already implemented	already validated and demonstrated	n.a.	n.a.	medium	LB - specific hazards and urban/territorial scale	flooding; CCA; flood prevention; flood resistance; life-long flooding	http://www.floodprofile.eu/	
SNAR1_d_C16	Flood Profile	Technologies for Flood Protection of the Built Environment	FFT	01/11/2009 - 31/10/2012	developed and put into practice by the project	Assessment methodology and tool to identify likely level of damage to critical buildings	availability of an urban flood simulation model and risk mapping	funds availability; base guidelines	provide procedures and interconnecting the cascading effects and inter-linkages between the organisations, city systems and critical infrastructures	To offer guidance for the flood vulnerability analysis of critical infrastructure networks	Urban flood simulation; risk mapping; define interdependency of urban water networks	preparedness; security; CI; management	multihazard	city, regional	floods		multihazard	environmental, social, economic	yes	Trondheim (Norway), Ottawa (France) and Dordrecht (The Netherlands)	already implemented	already validated and demonstrated	n.a.	the method has proven the advantage of enhancing and steering the discussion on strategy development. the flood modelling is the key part of the process (should be as accurate as possible)	medium	LB - specific hazards and urban/territorial scale	flooding; CCA; flood prevention; flood resistance; life-long flooding	http://www.floodprofile.eu/	The specific framework was tested only for flood hazard case studies, the methodology could be valid also for other hazards
SNAR1_d_C17	RESILCITY	RESilience to cope with Climate Change in Urban areas	ICLEI	01/05/2016 - 30/04/2018	developed and put into practice by the project	Risk Assessment Framework	data availability; resources; collaboration with different stakeholders	funds availability; time	The resilience assessment framework (RAF) enables to highlight where the cities and respective urban services stand today regarding resilience to climate change, and to identify the most critical aspects to be improved, taking into account both the reference situation and the expected impacts of future climate change scenarios	Elicoiding and facilitating a structured resilience diagnosis of the cities and of the strategic urban sectors; Monitoring the resilience progress of a city or service over time	design of the framework; cooperation with stakeholders	CCA; DRM; DRR; resilience; security; Urban planning	city		climate-related	multihazard	social, cultural, economic, environmental	yes	Barcelona, Santa Coloma, (Portugal), Bristol, UK	already implemented	already validated and demonstrated	n.a.	The application of this framework in Bristol, Barcelona and Lisbon Cities have demonstrated that the RAF is a tool that provides support to a structured assessment of urban resilience to climate change with a focus on water. Even though it was developed within the scope of climate change and with a focus on the water cycle, replication to other hazards and services is considered as its foundation.	medium	LB - non specific hazards and urban/territorial scale	CCA; DRM; DRR; risk assessment framework; stakeholders; urban planning; urban resilience assessment framework	https://www.resilcity.com/-CITY-2018/12811/Webinar	
SNAR1_d_C18	Flood Profile	Technologies for Flood Protection of the Built Environment	FFT	01/11/2009 - 31/10/2012	developed and put into practice by the project	Risk assessment tool	availability of the tool with the risk matrix	risk matrix availability	The risk assessment tool consists of an analysis resulting in the generation of risk matrices	To support the discussion and the decision process for the stakeholders: acknowledge of the area risk factor	risk identification to mitigate these risk events and/or reducing vulnerability	preparedness; security; CI; management; risk assessment	multihazard	building, district, city	floods		multihazard	environmental, social, economic	yes	Trondheim (Norway), Ottawa (France) and Dordrecht (The Netherlands)	already implemented	already validated and demonstrated	n.a.	For a large number of possible flood events the risk has been evaluated and placed within the matrices showing the vulnerability to People and to the Environment	medium	LB - specific hazards and building/district scale	flooding; CCA; flood prevention; flood resistance; risk assessment;	http://www.floodprofile.eu/	The specific framework was tested only for flood hazard case studies, the methodology could be valid also for other hazards
SNAR1_d_C19	Flood Profile	Technologies for Flood Protection of the Built Environment	FFT	01/11/2009 - 31/10/2012	developed and put into practice by the project	Advanced Analysis tool - defining the interdependencies of self-structure networks	availability of the GIS architecture (Failure Models and Effect Analysis), computer tool	this type of scenario can be identified without an automation process but it is impossible to produce all imaginable scenarios	development of a tool enabling the study of interdependencies between networks subsequent to a disaster	The first is to allow visualization and update of the FMEA; the second is to design future scenarios; the third objective is to analyse the results and allow an overall understanding of interdependent network failure modes thanks to diagram representation of the results	shaking network disruption caused by floods accounting for interdependencies between networks	Risk Analysis; Network analysis; preparedness; DRM; CI	city		non-specific hazard		multihazard	economic, social	yes	Trondheim (Norway), Ottawa (France) and Dordrecht (The Netherlands)	already implemented	already validated and demonstrated	n.a.	The method demonstrated the importance of considering interdependencies of CI	medium	LB - specific hazards and urban/territorial scale	flooding; preparedness; analysis; CI; UIs	http://www.floodprofile.eu/	The specific framework was tested only for flood hazard case studies, the methodology could be valid also for other hazards
SNAR1_d_C20	Flood Profile	Technologies for Flood Protection of the Built Environment	FFT	01/11/2009 - 31/10/2012	developed and put into practice by the project	Storyline method	good historic knowledge of the area	method do not permit to compare two different areas; not suitable for large areas	A storyline is a realistic sequence of incidents and human responses that may happen during a flood event. The storyline aids in analysing the consequences of a flood on critical infrastructure including the effects of outfall of a network or part of a network on other networks and on society (number of people affected, costs, etc.). Applying this storyline method provides a clear, neutral basis for discussion on what may happen and what could be done	To support the analysis of CI vulnerability; to help to flood event management and strategy development	evaluating the consequences of a flood on critical infrastructure including the effects of outfall of a network or part of a network on other networks and on society (number of people affected, costs, etc.)	Risk Analysis; Network analysis; preparedness; DRM; CI	city		floods		multihazard	environmental, social, economic	yes	Dordrecht, Netherlands	already implemented	already validated and demonstrated	n.a.	the method showed in which components there is a knowledge gap and it also gave an indication of the factors that will always be uncertain, such as human behaviour.	medium	LB - specific hazards and urban/territorial scale	flooding; preparedness; analysis; CI;	http://www.floodprofile.eu/	The specific framework was tested only for flood hazard case studies, the methodology could be valid also for other hazards
SNAR1_d_C21	RESCIT	New Integrated Knowledge Based Approaches to the Protection of Cultural Heritage from Earthquake-Induced Risk	FFT	01/01/2010 - 31/12/2012	developed and put into practice by the project	Numerical Modelling and Analysis	availability of previous documentary research and inspection outcomes (previous alterations, interventions, NDT inspections...)	resources availability; skilled staff	The information gathered are used for the preparation of the numerical models' input data and a preliminary structural analysis of the behaviour of the building	To verify the response of the building in case of earthquake; can be used in support of intervention design	preparation of numerical models' input for preliminary structural analysis	preparedness; DRM; security; resilience;	building		earthquakes		multihazard	cultural, economic, social	no		already implemented	not totally documented but promising and inspiring		n.a.	high	LA - specific hazards and building/district scale	earthquake; preparedness; structure analysis; inspection	http://www.rdec.eu/it/metodo/	The GP is part of the 4 steps integrated methodology used and validated in the project
SNAR1_d_C22	RESCIT	New Integrated Knowledge Based Approaches to the Protection of Cultural Heritage from Earthquake-Induced Risk	FFT	01/01/2010 - 31/12/2012	collected and classified by the project	Monitoring for the diagnosis phase	resources, technologies	funds for technologies; skilled staff;	The monitoring system allows to detect changes in the structure; the use of a numerical model may help interpret the monitoring results and design stabilization interventions.	monitoring of structure	installation of monitoring systems; possible dynamic investigation tests	preparedness; DRM; security; resilience; risk assessment; monitoring;	building		earthquakes		multihazard	cultural, economic, social	no		already implemented	not totally documented but promising and inspiring	n.a.	n.a.	medium	LA - specific hazards and building/district scale	earthquake; preparedness; structure analysis; inspection; monitoring; early warning	http://www.rdec.eu/it/metodo/	The GP is part of the 4 steps integrated methodology used and validated in the project
SNAR1_d_C23	RESCIT	New Integrated Knowledge Based Approaches to the Protection of Cultural Heritage from Earthquake-Induced Risk	FFT	01/01/2010 - 31/12/2012	collected and classified by the project	Seismic assessment based on the structural numerical model	updated and validated numerical model	skilled staff	capacity spectrum method combined with kinematic first analysis or nonlinear analysis, or non-linear dynamic analysis in the time domain, can be used for seismic assessment	analysis of the performance of the building	application of different analysis approached to the numerical model	preparedness; DRM; security; resilience; risk assessment; monitoring;	building		earthquakes		multihazard	cultural, social, economic	no		already implemented	not totally documented but promising and inspiring	n.a.	n.a.	medium	LA - specific hazards and building/district scale	earthquake; preparedness; structure analysis; numerical model; building performance; seismic assessment;	http://www.rdec.eu/it/metodo/	The GP is part of the 4 steps integrated methodology used and validated in the project
SNAR1_d_C24	RESCIT	New Integrated Knowledge Based Approaches to the Protection of Cultural Heritage from Earthquake-Induced Risk	FFT	01/01/2010 - 31/12/2012	collected and classified by the project	Periodical and/or periodical inspections	resources; monitoring and inspection technologies	skilled staff; funds availability	Monitoring the structures with NDTs and/or recording systems. The repeated application of this type of techniques may contribute to the identification of variations in the response of the structure caused by increasing damage. The effect of possible interventions such as deep repointing or injections may be also evaluated by applying consistent inspection techniques before and after the interventions. Applied NDTs: sonic pulse velocity; radar techniques; thermovision; crack monitoring	detecting variations in the structure stability	periodical inspections	preparedness; security; management;	building		earthquakes		multihazard	cultural, economic	yes		already implemented	not totally documented but promising and inspiring	n.a.	n.a.	medium	LA - specific hazards and building/district scale	earthquake; preparedness; structure analysis; inspection; NDTs; monitoring;	http://www.rdec.eu/it/metodo/	The GP is part of the 4 steps integrated methodology used and validated in the project
SNAR1_d_C25	RESCIT	New Integrated Knowledge Based Approaches to the Protection of Cultural Heritage from Earthquake-Induced Risk	FFT	01/01/2010 - 31/12/2012	collected and classified by the project	Static Monitoring System	resources; monitoring technologies	skilled staff; funds availability	This group of techniques (complementary to NDTs) selected involves the measurement of different variables, both environmental and structural, across a long period of time according to some predefined time intervals	detecting variations in the structure	application of sensors on the surface of the structure and/or tomographic monitoring	preparedness; security; management; monitoring	building		earthquakes		multihazard	cultural, economic	yes	Rocca di Verona, Italy	already implemented	already validated and demonstrated	n.a.	allowed to set adequate safety thresholds to successfully keep the building under control and constantly preserve the execution of possible interventions unless a worsening of the structural conditions was revealed	medium	LA - specific hazards and building/district scale	earthquake; preparedness; structure analysis; inspection; monitoring system; early warning system	http://www.rdec.eu/it/metodo/	
SNAR1_d_C26	RESCIT	New Integrated Knowledge Based Approaches to the Protection of Cultural Heritage from Earthquake-Induced Risk	FFT	01/01/2010 - 31/12/2012	collected and classified by the project	Dynamic identification and monitoring	resources; monitoring technologies	skilled staff; funds availability	The dynamic identification (DI) tests are able to give information on the global dynamic behavior of the building, including information on natural frequencies, damping and modal shapes. Dynamic identification tests are of special importance for the updating and validation of structural models. The results are directly related to the physical and structural parameters of the structure.	monitoring structure and detecting changes	application of dynamic monitoring system such as accelerometers sensors, radar interferometry	preparedness; security; management; monitoring	building		earthquakes		multihazard	cultural, economic	yes	Mallorca Cathedral, Spain	already implemented	already validated and demonstrated	n.a.	allowed a better understanding of its dynamic behavior compared to that obtained by means of previous dynamic identification dynamic tests; allowed calibrating and selecting numerical models	medium	LA - specific hazards and building/district scale	earthquake; preparedness; structure analysis; inspection; monitoring system; early warning system; long term monitoring; current and modern dynamic test	http://www.rdec.eu/it/metodo/	

SNAR1_d_017	SuMMARI	Enhancing decision support and management services in extreme weather climate events	FORUM	01/01/2017 - 31/01/2019	developed and put into practice by the project	Training and Pilot Set-up to validate the methodology prototype developed in the project	targeted policies specific methodology: parts/parties of stakeholders	methodology: time and permission; available assets	The training will teach stakeholders and managers of the area how to use the tools and methodology developed in the project: key roles of the stakeholders/managers in a disaster event are established, the pilot set-up will help validate the prototype developed	validate the active involvement of stakeholders and applicability of the methodology developed during the project; verify preparedness for innovative scenarios after screening of the event	training of stakeholder groups; pilot set up exercises	preparedness; DRM; security management	multirisk	building; district; city	multihazards	wildfire; heatwaves; flood	multiscope	social; cultural; economic	no	Thessaloniki, Kavala, Ventotene, Italy, Valencia, Spain	already implemented	already validated and demonstrated	n.a.	clear roles among stakeholders are the key factors to manage the event; the 1st Pilot set-up scenario identified some gaps in the structured methodology, later integrated and validated in the 2nd set up; helped map out the platform used by stakeholders and citizens to identify the risk; helped enhancing the training methodology	high	GI - non-specific hazards and building/district scale	preparedness; DRM; stakeholders; training; citizens; management; urban resilience; pilot case; efficiency	https://shelter-project.eu/	
SNAR1_d_018	FIRESENSE	Fire Detection and Management through a Multi-Sensor Network for the Protection of Cultural Heritage Areas from the Risk of Fire and Extreme Weather Conditions	FRT	01/11/2016 - 28/02/2019	developed and put into practice by the project	Multisensor early warning system Network	resources; installation of the sensors;	funds availability; skilled staff; necessity of a constant maintenance of the device; advanced control centre;	In the project an automatic early warning system integrating multiple sensors to remotely monitor areas of archaeological and cultural interest for the risk of fire and extreme weather conditions was developed. The central centre is capable of generating automatic warning signals for smoke/flame detection and abrupt temperature rise. Moreover, by reading weather data from official meteorological services as well as 7 site local weather stations, it is can also issue alerts in case of extreme weather conditions.	warning in case of extreme weather conditions are detected;	use of the sensors to anticipate a possible abnormal event and prevent damage;	DRM; security; resilience;	district		multihazards	wildfire; heatwaves;	multiscope	cultural; economic; environmental;	no	Mt. Sanctuary of Palaistros in Dikteon, Zeminos the ancient city of Rhodiapolis in Antalya, Turkey; the Uludağ Hall building in Istanbul, Turkey; the Roman Temple of Water in Ostrich Daghouan, Tunisia; Monterberico Aulenti Park in Prato, Italy;	already implemented	already validated and demonstrated	n.a.	Numerous controlled fire tests have organized in several sites to assess system functionalities and evaluate system performance. The system achieved high detection rates and has successfully detected two real fires in Rhodiapolis in September and October 2012.	high	GI - specific hazards and building/district scale	wildfire; fire heatwaves; CH; risk; archaeological area; early warning; monitoring; CCA;	https://firesense.eu/project/FIRESENSE/overview	
SNAR1_d_019	FRAMAR	Flood Risk Assessment and mitigation for Masonry Arch Bridges	H2020	01/10/2015 - 30/09/2017	developed and put into practice by the project	Flood Risk Assessment Framework	resources; technologies	funds availability; experienced team; skilled staff	defining a flood risk assessment framework for masonry arch bridges combining a realistic description of the hazard (probability of exceeding a given flood discharge) with an accurate assessment of the structural vulnerability (probability of exceeding a given damage level in the bridge components for a flood with a given intensity)	contribute to the preservation of cultural heritage and can support decision makers in mitigating the flood risk of infrastructural systems and prioritising retrofit interventions;	modelling strategy to later simulate flood effect on the bridge structures; probabilistic framework for flood risk assessment analysis	resilience; conservation; preservation; monitoring;	building		floods		multiscope	cultural; economic; environmental;	no		already implemented	not totally documented but promoting and inspiring	n.a.	The developed tools provide an important contribution to (1) the preservation of cultural heritage for the vitality of the living engagements within and across European cultures, (2) the development of innovative technologies and solutions to reduce the perception of vulnerability from natural disasters, and (3) the achievement of a resource efficient economy and society. The output of the proposed risk assessment procedure can support decision making in flood risk management of bridges.	low	GI - specific hazards and building/district scale	modelling; preservation; flood; masonry; prevention strategies; computing tools; engineering; preservation; innovative technologies;	https://framar.eu/project/FRAMAR/overview	
SNAR1_d_020	GCCHI-MK	GLOBAL CLIMATE CHANGE IMPACT ON MULTI-HAZARDS AND CULTURAL LANDSCAPES	FYR - FOCUS	01/06/2014 - 31/05/2017	developed and put into practice by the project	vulnerability atlas for Europe and accompanying management guidelines	risk and hazard maps; specific guidelines;	skilled staff;	network of tools and a database of information for stakeholders to evaluate threats, run different scenarios and predict the effectiveness of various strategies. It also established an advisory panel to prepare recommendations and guidelines for authorities and policymakers to tackle the effects of different weather phenomena.	predict different scenarios; preparedness in case of an event;	to outline mitigation strategies for sites, monuments and specific materials that were under risk; realization of risk map and increased risk assessment of guidelines and procedures;	DRM; resilience; security; conservation	building		non-specific hazard		multiscope	cultural; economic; social	no		already implemented	not totally documented but promoting and inspiring	n.a.	They have proved instrumental in enabling stakeholders, policymakers and implicated organisations to consider climate impact on Europe's heritage.	medium	GI - non-specific hazards and building/district scale	preparedness; DRM; efficiency; risk map; atlas of solutions; guidelines; stakeholders; climate impact; CCA; cultural; risk; decision of information;	https://gccchi.europa.eu/index.php/GCCHI-project-the-future-of-cultural-heritage	
SNAR1_d_021	SUBCOAST	A collaborative project aimed at developing a GMES service for monitoring and forecasting subsidence hazards in coastal areas around Europe	FFT - SPACE	01/04/2010 - 30/09/2011	developed and put into practice by the project	subsidence hazard forecasting service (key module of Copernicus)	availability of well defined geodetic data; construction of digital elevation maps;	funds availability; related staff; advanced technology	use the data and the methodology developed to assess the impact of subsidence on flood risk and to monitor the integrity of coastal barrier systems	it will help flood risk practitioners to accurately estimate subsidence rates	calculation of digital elevation map; regular acquisition of radar data from ESA satellites	CCA; resilience; security;	region		subsidence		multiscope	cultural; social; economic; environmental	no		already implemented	not totally documented but promoting and inspiring		medium	GI - specific hazards and urban/territorial scale	subsidence; CCA; climate impact; flood; information database; geodetic data; digital elevation maps; Copernicus; satellite;	https://gccchi.europa.eu/index.php/GCCHI-project-subsidence-hazards-in-coastal-regions	
SNAR1_d_022	AYAME	Archaeoseismology and Paleoseismology for the protection of cultural heritage and archaeological sites in the Middle East	FFT	01/01/2011 - 31/08/2016	collected and classified by the project	Archeological and paleoseismic data and results including quantitative morphology, geophysical prospecting and GPS results	resources; technologies	funds availability; skilled staff	Field observations (including quantitative geomorphology with measurements of past displacements and structural analysis of fault zones) can reveal a fault segmentation and help identify active earthquake slip deficit	identification of potential future large earthquake location	Geophysical and geodetic investigations; use of past seismicity catalogues;	security; preparedness; DRM	region		earthquakes		multiscope	social; environmental; economic	no	Jordan, Lebanon, Syria and Turkey	already implemented	not totally documented but promoting and inspiring		These results were an important contribution to the identification of active fault earthquake slip deficit and the potential for future large earthquakes at the junction.	low	GI - specific hazards and urban/territorial scale	earthquake; geodetic; geophysical; seismology; catalogues; paleoseismology; archaeoseismology; GPS; investigations;	https://fundis.europa.eu/actions/FRAMAR/overview	
SNAR1_d_023	PROMETEO	Science Protection of Historical Buildings by Reversible Mixed Technologies	ITN	01/10/2009 - 30/09/2013	developed and put into practice by the project	improvement of building seismic performance by means of reversible mixed technologies (RMT)	resources; technologies	funds availability; skilled staff	Its main objective was to develop sustainable methodologies for the use of reversible mixed technologies in the seismic protection of existing constructions, with particular emphasis on buildings of historical interest. Reversible mixed technologies exploit the peculiarities of innovative materials and special devices, allowing ease of removal if necessary. At the same time, the combined use of different materials and techniques yields an optimization of the global behaviour under seismic actions.	Use of innovative materials and mixed technologies to ensure an adequate performance, and structural integrity under strong seismic actions.	ensure seismic protection through the use of RMT; integration of structural materials of different materials and/or construction methods into a single construction; preserve the monumental value and its material integrity	resilience; conservation; preparedness; security;	building		earthquakes		multiscope	social; cultural; economic;	no	The Duomo of Lecce in Apulia (Italy); the Mirabella Feudal Mansion in Sicilia (Mezzanone); the Gothic Cathedral in Constanza (Italy); the Byzantine St. Nikola Church in Prizba, Gros Fabenka (Macedonia); the Bejlerbeyi Palace in Istanbul (Turkey)	already implemented	not totally documented but promoting and inspiring			high	GI - specific hazards and building/district scale	seismic protection; earthquakes; CH; RTM; innovative materials; reversibility;	https://prometeo.europa.eu/actions/PROMETEO/overview	
SNAR1_d_024	CAVEMANRO	Culture And Rebemanagement to Man-made And Natural Disasters	H2020	01/10/2017 - 30/09/2018	collected and classified by the project	Making Preparedness Attractive	resources; social media channels	public accessibility; time; staff following social media channels	One of the main challenges with preparedness is to make it attractive to citizens. Making preparedness attractive has several facets: the content, the form of the content, and the platform on which the content is displayed.	Make citizens aware and prepared for the risk.	Asking public awareness and interest to CH; making video/gamification initiative using humor; visual communication; gaming culture; events with virtual reality;	preparedness; DRM; community engagement; stakeholders; risk awareness;	multiscale	building; district; city	non-specific hazard		multiscope	social; cultural; economic;	no		already implemented	not totally documented but promoting and inspiring		Methodology has proven valid but not totally documented	high	GI - non-specific hazards and building/district scale	public awareness; community engagement; DRM; stakeholders; preparedness;	https://www.cultureand.eu/resources.html	More information and downloadable deliverables on: https://cordis.europa.eu/project/id/611490/results
SNAR1_d_025	CAVEMANRO	Culture And Rebemanagement to Man-made And Natural Disasters	H2020	01/10/2017 - 30/09/2018	collected and classified by the project	Technology and Social Media: Education and Communication Strategy	social media channel; resources;	public accessibility; time; staff following social media channels	During a disaster, a large part of citizens will search for information on social media platforms; authorities and disaster managers need to set up a communication strategy in advance. This strategy must take into account local/cultural use of technology, legal framework, risk culture and language issues for instance. Information about good use of social media can be taught before the disaster and this is the goal sought by technology education related to risk management. It can also help in post emergency phase to detect the consequence of the event through interaction with citizens.	Make citizens be able to use social media and technology as useful tools during a disaster	sharing information on social channels; using infographics; using it to raise awareness; spread of useful information/good practice of actions to keep in mind during a disaster;	preparedness; DRM; community engagement; stakeholders; risk awareness;	multiscale	building; district; city	non-specific hazard		multiscope	social; cultural; economic;	no		already implemented	not totally documented but promoting and inspiring			high	GI - non-specific hazards and building/district scale	public awareness; community engagement; DRM; technology; stakeholders; preparedness; social media;	https://www.cultureand.eu/resources.html	More information and downloadable deliverables on: https://cordis.europa.eu/project/id/611490/results
SNAR1_d_026	CAVEMANRO	Culture And Rebemanagement to Man-made And Natural Disasters	H2020	01/10/2017 - 30/09/2018	collected and classified by the project	Dedicated Alert Apps	public app; involvement of citizens; resources; download of the app;	funds availability; public accessibility; skilled staff;	Development and dissemination of Apps dedicated to alert systems. Everyone with the app can give the alerts and access to advices for security and management of the event.	use this tools to engage citizens: use the tool as warning system;	development of dedicated Alert Apps	preparedness; DRM; community engagement; stakeholders; risk awareness; warning system;	multiscale	building; district; city	climate related		multiscope	social; cultural; economic;	no	Florence, Italy	already implemented	already validated and demonstrated		Apps designed by Civil Protection and other bodies proved useful in managing disaster events in the past to reach the citizens during the event. They also proved useful for tracking the spread of the event (fire, flood, storm). It proved useful after an earthquake in Japan to alert citizens of potential following quakes. It allowed to inform through loudspeakers installed in stores of the safety meeting points. Learning also people with disability or no access to technology; helped locate injured, missing people.	high	GI - non-specific hazards and building/district scale	public awareness; community engagement; DRM; technology; stakeholders; citizens; mobile Apps; social media; emergency phase;	https://www.cultureand.eu/resources.html	More information and downloadable deliverables on: https://cordis.europa.eu/project/id/611490/results
SNAR1_d_027	CAVEMANRO	Culture And Rebemanagement to Man-made And Natural Disasters	H2020	01/10/2017 - 30/09/2018	collected and classified by the project	Screen for Alerts	resources; screens availability; skilled staff; policies;	funds availability; skilled staff; availability; public accessibility; common language;	Use of the screens to alert citizens during an event of safety meeting points; use of the screens to locate missing people;	use of text-texting as emergency phase	Putting screens in emergency zones; develop targeted policies for the DRM phase;	preparedness; DRM; community engagement; stakeholders;	multiscale	building; district; city			multiscope	social; cultural; economic;	no	Japan	already implemented	already validated and demonstrated			medium	GI - non-specific hazards and building/district scale	public awareness; community engagement; DRM; technology; stakeholders; citizens; mobile Apps; social media; emergency phase;	https://www.cultureand.eu/resources.html	More information and downloadable deliverables on: https://cordis.europa.eu/project/id/611490/results

SNR01_d_038	FARYAMIND	Culture And Risk management in Man-made And Natural Disasters	H2020	01/10/2001 - 30/09/2004	collected and classified by the project	Crowdsourcing information	technology availability	public accessibility	The research on web, apps, social media allow the system to locate an event. Through people searching information about a damage environment can be crowdsourced as technologies allow having a direct contact with communities on the ground who can comment about the extent of the damages. DRM tools can allowing the collection of crowdsourcing from experiences which rapidly provide live information for situational awareness. For all types of disasters, experiences also comment on social media, which enhance the crowdsourcing.	collect information about an event, detect an event	collect information based on resources of internet/app/social media users	preparedness; DRM; community engagement; stakeholders	multiscale	building; district; city	non-specific hazard		multiscale	social; cultural; economic	no	Izmit in Anatolia, Italy	already implemented	already validated and demonstrated		gave the opportunity to create a series of maps, including those relating to roads, available housing, ongoing fundraising initiatives, and an archive of documentation and public acts collected through the daily work of volunteers, which can be a monitoring and review tool for all those who are involved in various rebuilding tasks	high	CC - non-specific hazards and building/district scale	public awareness; community engagement; DRM; technology; stakeholders; citizens; mobile Apps; social media; emergency phase;	https://www.carthage.edu/resources/	More information and downloadable deliverables on: https://cordis.europa.eu/project/id/261717/results
SNR01_d_039	SHIELD	Enhancing Synergies for disaster Prevention in the EuOpean Union	H2020	01/01/2016 - 31/12/2018	developed and put into practice by the project	SHIELD MODEL Sharing knowledge: map the field of relevant actors	resources; cooperation among stakeholders		Making it clear with whom it is relevant to share knowledge and information with in the future is the first and a vital step in optimizing disaster risk governance. This will help have clear the role of each figure in DRR and CCA without wasting resources and time.	clarify the role and action of each figure among stakeholders	build a map of the roles to outline the gaps or links necessary to efficiently manage DRR and CCA	preparedness; DRR; DRM; stakeholders; resilience; response; security; prevention; recovery;	multiscale	building; district; city; regional; cross-regional	non-specific hazard		multiscale	social; cultural; economic	no		already implemented	not totally documented but promoting and training			high	CC - non-specific hazards and urban/territorial scale	DRR; DRM; CCA; stakeholders; preparedness; response; prevention;	http://www.cuprisonline.com/commentaries/shield-project-on-disaster-risk-governance.html	The practice is part of the SHIELD model developed in the project
SNR01_d_040	SHIELD	Enhancing Synergies for disaster Prevention in the EuOpean Union	H2020	01/01/2016 - 31/12/2018	developed and put into practice by the project	SHIELD MODEL Bridge knowledge gaps between science and policy	resources; policies;	funds availability; targeted policies	Identifying partners (companies, universities...) who could enable knowledge sharing between the science and policy domains. Input from scientific experts are vital in relation to questions such as risk assessments and raising public risk awareness.	guarantee scientific knowledge to the DRM process		CCA; DRM; resilience; DRR; preparedness; recovery;	multiscale	building; district; city; regional; cross-regional	disaster-related		multiscale	social; cultural; economic; environmental	no		already implemented	not totally documented but promoting and training			high	CC - non-specific hazards and urban/territorial scale	DRR; DRM; CCA; stakeholders; preparedness; response; prevention;	http://www.cuprisonline.com/commentaries/shield-project-on-disaster-risk-governance.html	The practice is part of the SHIELD model developed in the project
SNR01_d_041	SHIELD	Enhancing Synergies for disaster Prevention in the EuOpean Union	H2020	01/01/2016 - 31/12/2018	developed and put into practice by the project	SHIELD MODEL Create frameworks and platforms	resources	funds availability; stakeholders cooperation; legal frameworks; political leverage	Create DRR platforms available to all the actors in all phases of DRRM; promote effective knowledge sharing among stakeholders; if necessary, provide incentives for sharing information;	enhance cooperation among involved actors and exchange of information available	virtual database networks; risk web platforms; regular meeting among involved partners and/or with citizens; promote interaction among departments rather than a "silo-guarding of secrecy" mentality	CCA; DRM; resilience; DRR; preparedness; knowledge sharing; stakeholders;	multiscale	building; district; city; regional; cross-regional	disaster-related		multiscale	cultural; economic;	no		already implemented	not totally documented but promoting and training			high	CC - non-specific hazards and urban/territorial scale	DRR; DRM; CCA; stakeholders; preparedness; response; prevention; knowledge sharing; cooperation; data basis;	http://www.cuprisonline.com/commentaries/shield-project-on-disaster-risk-governance.html	The practice is part of the SHIELD model developed in the project
SNR01_d_042	SHIELD	Enhancing Synergies for disaster Prevention in the EuOpean Union	H2020	01/01/2016 - 31/12/2018	developed and put into practice by the project	SHIELD MODEL Harmonizing capacities	resources; skilled staff	stakeholders cooperation;	Identifying and ensuring the necessary expertise, equipment, and other forms of capacities within public institutions for implementing disaster risk governance; identify possible gaps in the roles necessary for DRM;	building and maintaining the necessary breadth of expertise, knowledge and skills among employees in all types and at all levels of government bodies; developing better use of existing capacities	map existing capacities; assess and balance capacities; create local partnerships;	governance; preparedness; DRR; CCA; stakeholders; resilience;	multiscale	building; district; city; regional; cross-regional	disaster-related		multiscale	cultural; economic;	no		already implemented	not totally documented but promoting and training			high	CC - non-specific hazards and urban/territorial scale	DRR; DRM; CCA; stakeholders; preparedness; response; prevention; knowledge sharing; cooperation; data basis; governance;	http://www.cuprisonline.com/commentaries/shield-project-on-disaster-risk-governance.html	The practice is part of the SHIELD model developed in the project
SNR01_d_043	SHIELD	Enhancing Synergies for disaster Prevention in the EuOpean Union	H2020	01/01/2016 - 31/12/2018	developed and put into practice by the project	SHIELD MODEL Engaging stakeholders	cooperation among stakeholders; agreements;	lack of common understanding among stakeholders; competing interest;	Start engaging processes for stakeholders involvement and cooperation	promote stakeholders inclusion and engagement for agreements and frameworks on DRR	clarify the roles of the stakeholders; create incentives for stakeholder participation; cooperation mediators and experienced well-roles; create web-based online participating platforms; use stakeholder local knowledge to define DRR actions; ensure sustained commitment;	governance; preparedness; DRR; CCA; stakeholders; resilience;	multiscale	building; district; city; regional; cross-regional	non-specific hazard		multiscale	cultural; economic;	no		already implemented	not totally documented but promoting and training			high	CC - non-specific hazards and urban/territorial scale	DRR; DRM; CCA; stakeholders; preparedness; response; prevention; knowledge sharing; cooperation; data basis; governance;	http://www.cuprisonline.com/commentaries/shield-project-on-disaster-risk-governance.html	The practice is part of the SHIELD model developed in the project
SNR01_d_044	SHIELD	Enhancing Synergies for disaster Prevention in the EuOpean Union	H2020	01/01/2016 - 31/12/2018	developed and put into practice by the project	SHIELD MODEL Leveraging investments	financial and political investitures;		It was found that effective risk reduction investments can reduce the economic losses following disasters as well as shifts in investment strategies that can benefit the economy of a country, region, city or town even before the disaster has struck.	finding political and financial transition to provide for every DRR phase;	make sense of DRR investments visible (service publication and effective communication); innovate existing disaster risk financing structures; Create partnerships for DRR investments with the private sector; Make long-term political agreements; identify DRR and CCA overlaps	governance; preparedness; DRR; CCA; stakeholders; resilience; investments;	multiscale	building; district; city; regional; cross-regional	climate-related		multiscale	cultural; economic; social	no	Hedy, Denmark	already implemented	not totally documented but promoting and training			high	CC - non-specific hazards and urban/territorial scale	DRR; DRM; CCA; stakeholders; preparedness; response; prevention; knowledge sharing; cooperation; data basis; governance;	http://www.cuprisonline.com/commentaries/shield-project-on-disaster-risk-governance.html	The practice is part of the SHIELD model developed in the project
SNR01_d_045	SHIELD	Enhancing Synergies for disaster Prevention in the EuOpean Union	H2020	01/01/2016 - 31/12/2018	developed and put into practice by the project	SHIELD MODEL Developing communication				promote and develop communication among stakeholders, governance, citizens	raise awareness of the risk and promote a good coping mechanism	governance; preparedness; DRR; CCA; stakeholders; resilience; investments;	multiscale	building; district; city; regional; cross-regional	non-specific hazard		multiscale	cultural; economic; social	no		already implemented	not totally documented but promoting and training			high	CC - non-specific hazards and urban/territorial scale	DRR; DRM; CCA; stakeholders; preparedness; response; prevention; knowledge sharing; cooperation; data basis; governance; communication;	http://www.cuprisonline.com/commentaries/shield-project-on-disaster-risk-governance.html	The practice is part of the SHIELD model developed in the project
SNR01_d_046	PERCLIS	Networking and sustainably governing Cultural Heritage and landscapes in European coastal and maritime regions	H2020	01/01/2016 - 30/04/2021	collected and classified by the project	Policy integration of cultural heritage in coastal and maritime policies	required policies	cooperation of different level of governance;	promote the planning of CH policies in several level of governance	integrated, transdisciplinary approach to planning and policy-making	realization of required policies;	governance; DRR; DRM; CCA; resilience;	multiscale	city, regional; cross-regional;	flood		multiscale	cultural; economic; environmental	no	Denmark, Ireland, Scotland, Northern Ireland, Portugal	already implemented	already validated and demonstrated		development of policies and tools for sustainable management and use of tangible and intangible cultural heritage resources and best/cases/ppts;	high	CC - specific hazards and urban/territorial scale	DRM; governance; policies; flood; CCA;	https://cordis.europa.eu/project/id/776534	
SNR01_d_047	ECOSIS	Ecosistir Risk Reduction Insurance	UFC	01/01/2021 - 30/06/2026	developed and put into practice by the project	Insurance company supporting climate adaptation action in small and medium size companies	resources; agreements;		Include expertise in risk management + from risk assessment to disaster recovery - to design specific tools and instruments for SMEs and municipalities to increase their risk awareness and build the resilience of industrial districts. An online tool was released for the assessment on climate risk.	include risk assessment expertise of insurance companies to the DRM process;	enhance innovation between public and private sector; integrating climate adaptation considerations in management and operational procedures;	DRR; DRM; CCA; resilience; planning; security;	city		climate-related		multiscale	economic; social; environmental;	yes	Turin, Italy	already implemented	already validated and demonstrated	n.a.	The initiative succeeded in increasing awareness about climate risks among SMEs, improving the knowledge available for increasing disaster risk preparedness and climate adaptation for SMEs, and supporting the design of Company Adaptation Action Plans.	medium	CC - non-specific hazards and urban/territorial scale	DRR; CCA; DRM; insurance company; preparedness; urban planning; risk assessment; public-private partnership; risk awareness;	https://climate-adapt.eea.europa.eu/metadata/case-studies/climate-ready-enterprises-a-company-supporting-climate-adaptation-action-in-small-and-medium-size-companies-in-north-italy/info#project_profile	
SNR01_d_048	BANA	Bottom-up climate Adaptation Strategies for Europe	FFT	01/11/2021 - 31/10/2026	developed and put into practice by the project	Design and implementation of flood protection measures: mobile barriers	resources; trained staff; storage;	public acceptability; funds availability; land property rights; conflicting view of investors and stakeholders;	Use of mobile barriers to prevent flooding which are mainly used in the old historical centre, and partly in the surrounding areas	protect areas affected by flooding or without permanent structures	activating of mobile barriers; training of mobile barriers installation; adaptation of a city-specific training area;	CCA; DRM; resilience; security; preparedness; DRR;	city		flood		multiscale	economic; social; environmental;	yes	Prague - Czech Republic	already implemented	already validated and demonstrated	n.a.	The success of the implemented flood protection system was proved during 2013 flood event, when great part of the city along Vltava River was protected and only very minor parts were flooded.	medium	CC - specific hazards and urban/territorial scale	DRR; DRM; CCA; stakeholders; preparedness; response; prevention; flood; barriers; protection measures;	https://climate-adapt.eea.europa.eu/metadata/case-studies/evaluation-of-flood-protection-measures-for-the-city-of-prague	
SNR01_d_049	BANA	Bottom-up climate Adaptation Strategies for Europe	FFT	01/11/2021 - 31/10/2026	developed and put into practice by the project	Design and implementation of flood protection measures: barriers (brooms, dykes, earth mounds, solid concrete walls)	opportunity to build the barriers in terms of availability space; property of the area; funds; time and permissions	public acceptability; funds availability; land property rights; conflicting view of investors and stakeholders;	Use of flood barriers along the coastal area outside the historical centre	protect valuables and rural areas	construction of the barriers;	CCA; DRM; resilience; security; preparedness; DRR;	city		flood		multiscale	economic; social; environmental;	yes	Prague - Czech Republic	already implemented	already validated and demonstrated	n.a.	The success of the implemented flood protection system was proved during 2013 flood event, when great part of the city along Vltava River was protected and only very minor parts were flooded.	high	CC - specific hazards and urban/territorial scale	DRR; DRM; CCA; stakeholders; preparedness; response; prevention; flood; barriers; protection measures;	https://climate-adapt.eea.europa.eu/metadata/case-studies/evaluation-of-flood-protection-measures-for-the-city-of-prague	
SNR01_d_050	BANA	Bottom-up climate Adaptation Strategies for Europe	FFT	01/11/2021 - 31/10/2026	developed and put into practice by the project	Design and implementation of flood protection measures: pumping systems and safety valves	resources; time and permissions; funds;	public acceptability; funds availability; land property rights; conflicting view of investors and stakeholders;	Use of measures like closures, pumping systems and safety valves in the consolidation network	implementation of protection measures (in addition to others)	installation of the security measures;	CCA; DRM; resilience; security; preparedness; DRR;	city		flood		multiscale	economic; social; environmental;	yes	Prague - Czech Republic	already implemented	already validated and demonstrated	n.a.	The success of the implemented flood protection system was proved during 2013 flood event, when great part of the city along Vltava River was protected and only very minor parts were flooded.	medium	CC - specific hazards and urban/territorial scale	DRR; DRM; CCA; stakeholders; preparedness; response; prevention; flood; barriers; protection measures;	https://climate-adapt.eea.europa.eu/metadata/case-studies/evaluation-of-flood-protection-measures-for-the-city-of-prague	

UNABO_d_CH1	BASE	Bottom-up climate Adaptation Strategies for Europe	ART	01/11/2011 - 31/10/2014	developed and put into practice by the project	participatory process to implement coastal flood defence strategy	time, funds; active public participation;	funds availability; involve	an innovative method for active public participation including an analysis of social and economic parameters was used in the process of selecting the coastal flood defence measures to be applied.	to increase risk awareness and communication; to discuss appropriate solutions based on the communities values and needs with community members; to review the coastal flood defence structure	assessment of socio economic values; sensitivity analysis; local engineering companies view; competition; participants meetings;	CCA; DRM; security; resilience; preparedness;	city		floods		multiscope	economic; social; environmental;	no	Timmendorfer Strand, Germany	already implemented	already validated and demonstrated	3) million euro	The agreed coastal flood defence measure was a sheet pile wall integrated in the natural beach ridge. Local acceptance of the defence measures adopted.	medium	GB - specific hazards and urban/territorial scale	participatory approach; community engagement; stakeholders; flood defence measures; coastal defence; cost benefit analysis; economic assessment; landscaping; tourism	https://climate-adapt.eea.europa.eu/metadata/case-studies/timmendorfer-strand-coastal-protection-strategy-germany/flood_benefit-analysis
UNABO_d_CH2	CALDAS	Development of an stage alert analysis system for as a effective fire consciousness of forests	UPTo	01/09/2010 - 31/08/2013	developed and put into practice by the project	Integrated forest fire analysis system (IFAS)	resources; installation of sensors; availability of data; time; training session to use the system;	availability of data; funds availability; capacity of stakeholders and managers of using the monitoring system;	The system is useful to know when environmental conditions are favourable for fire development; it is also is capable of estimating the evolution of a wild forest fire. At scenario level: 1) for personnel training purposes; 2) for planning of the necessary fire conservancy infrastructure (fire monitoring stations, firebreak zones, water tanks, etc.); At operational level: for decision making and coordination during forest fire incidents	improve the knowledge and skills of civil protection professionals and services on effective temporal and spatial planning of resources; increase the effectiveness and readiness of fire brigades, civil protection, local communities and any other stakeholders to deal with forest fire threats	installation of meteorological stations; collection of spatial information; development of proper management strategies; stakeholders and security bodies involvement;	CCA; DRM; preparedness; resilience;	region		wildfire		multiscope	economic; social; environmental;	no	Thessaloniki, Cyprus; Grammos, Greece	already implemented	already validated and demonstrated	n.a.	The system allows for the landscape characterization to manage the fire risk. The use of meteorological stations and meteorological information provides detailed information on the environmental characteristics of the two pilot areas. It also involves local stakeholders (such as fire services, civil protection and local communities) as the information obtained with the application of the system were disseminated in order to discuss further strategies to cope with the risk.	high	GB - specific hazards and urban/territorial scale	Forest fire, forest management, information network, land use planning, monitoring station, risk assessment, DRR; CCA; DRM;	https://climate-adapt.eea.europa.eu/metadata/case-studies/design-integrated-strategic-system-for-the-effective-fire-conservancy-of-forests
UNABO_d_CH3	EFI-WATER	Evaluating Economic Policy Instruments for Sustainable Water Management in Europe	ART	01/01/2011 - 31/12/2013	developed and put into practice by the project	Temporary flood water storage in agricultural areas	targeted policies; government and stakeholder participation; funds	funds availability; public acceptability; elevated long term cost of the practice.	Activation of flood defence temporary reservoirs in agricultural areas as protection measures during extreme events. This is to be activated when dikes and other security measures are not enough	use of agricultural lands to divert floodings to protect urban areas	governance and landowners participatory approach; provide compensation funds and incentives for farmers;	CCA; DRM; DRR; resilience; preparedness; security;	cross-regional		floods		multiscope	economic; social; environmental;	no	Middle Tisza river basin, Hungary	already implemented	already validated and demonstrated	n.a.	The project has shown to be extremely effective in terms of flood risk mitigation. At the same time, when activated, is very expensive both for governance (compensation funds) and for farmers (compensation covers yield losses, but it does not take into consideration soil rehabilitation and the financial consequences due to the disruption of the seasonal production cycle)	medium	GB - specific hazards and urban/territorial scale	DRR; DRM; preparedness; governance; stakeholders; Economic Policy Instruments; flood protection system; retention ponds; temporary storage reservoirs	https://climate-adapt.eea.europa.eu/metadata/case-studies/temporary-flood-water-storage-in-agricultural-areas-the-middle-tisza-river-basin-hungary
UNABO_d_CH4	COASTCONF	COastal Research and Policy OrganisAtion -	Interreg IVB		developed and put into practice by the project	adoption of an integrated Coastal Management strategy (ICZM)	stakeholder participation; funds	stakeholders long term partnership; time	integration of risk associated with climate change, through the establishment of a strategic alliance (coastal) between the local authority and multidisciplinary academic experts. It produced the ICZM progress indicator; replicable in other case studies.	establishment of a ICZM framework strategy;	involvement of stakeholders in a long term process; use of scenarios to help visualise various options for the harbour area under different climate change circumstances; individualise of the stakeholders primary concerns in relation to the flood scenarios; periodical meetings to produce the Adaptation Strategy;	CCA; DRM; DRR; resilience; security; Adaptive planning;	city		floods		multiscope	social; environmental; economic;	no	Cork Harbour, Ireland	already implemented	already validated and demonstrated		The process has developed institutional capacity in adaptation planning and strategy development, and has fostered greater levels of information sharing across agencies and organisations to better inform activities targeted at coastal management and climate adaptation	medium	GB - specific hazards and urban/territorial scale	CCA; stakeholder; DRR; adaptive planning; preparedness; management strategy; resilience; adaptation strategy; partnership; flood management;	https://climate-adapt.eea.europa.eu/metadata/case-studies/integrated-management-and-adaptation-strategies-for-cork-harbour-ireland/Evaluation_report.pdf
UNABO_d_CH5	BASE	Bottom-up climate Adaptation Strategies for Europe	ART	01/11/2011 - 31/10/2014	developed and put into practice by the project	comprehensive Adaptation Plan	resources; time; targeted policies;	time; public acceptability; funds;	rethinking urban planning and adaptation measures integrating adaptation concerns into other policy areas, including community regeneration.	rethink urban planning under adaptation measure awareness raising (specific allocations in the city budget for adaptation measures)	separating surface water (rainwater) from the underground wastewater system (making city resilient up to 100 year rains); refitting urban spaces to create rainwater channels along selected roads, leading to the lakes and/or the sea; greening and 'greying' public spaces for local reduction of water; climate proofing buildings and transport infrastructure;	CCA; DRM; DRR; resilience; security; Urban planning;	city		floods		multiscope	social; environmental; economic	no	Copenhagen, Denmark	in progress	already validated and demonstrated	n.a.	Adaptation policies and actions have been integrated with the city development based on strong green growth. Invests public and private spaces and a growing attention to the use of nature-based solutions while also putting adaptation knowledge and skills in the local administration.	high	GB - specific hazards and urban/territorial scale	DRR; DRM; CCA; stakeholders; adaptive urban planning; adaptation actions; stormwater management; eco-system based approach;	https://base-adaptation.eu/master-initiative-copenhagen-cloudburst-strategy-copenhagen-denmark
UNABO_d_CH6	BASE	Bottom-up climate Adaptation Strategies for Europe	ART	01/11/2011 - 31/10/2014	developed and put into practice by the project	Cloudburst Management Plan	resources; time; targeted policies; individual properties	time; funds; public acceptability;	The plan builds on a detailed socio-economic assessment to ascertain whether cloudburst and stormwater management can pay off for society as a whole	reduce impacts of pluvial flooding due to heavy rains	Stormwater roads and pipes that transport water towards lakes and the harbour. Detention roads for storing water; Detention areas to store very large volume of water; Green roads to detain and hold back water in smaller side streets	CCA; DRM; DRR; resilience; preparedness; security; Adaptive planning;	city	multihazards	floods; storms	multiscope	social; cultural; economic;	no	Copenhagen, Denmark	in progress	already validated and demonstrated	DKK 1 billion (financed by the City of Copenhagen)		low	GB - specific hazards and urban/territorial scale	DRR; DRM; CCA; stakeholders; adaptive urban planning; adaptation actions; stormwater management; eco-system based approach;	https://climate-adapt.eea.europa.eu/metadata/case-studies/the-economics-of-managing-heavy-rain-and-stormwater-in-copenhagen-2013/the-cloudburst-management-plan
UNABO_d_CH7	CLIMAtec	Financial institutions preparing the market for adapting to climate change	UPTo	01/01/2010 - 31/12/2012	developed and put into practice by the project	Climate Risk Management Model for financial institutions	CRMM tool; resources;	funds availability; financial institutions acceptability;	development of the Climate Risk Management Model (CRMM) which provides integrated solutions, suggesting interventions that enhance businesses' adaptability to new climatic conditions and reduce their carbon footprint.	developing an innovative approach to adaptation of enterprises to the financial impacts of climate change	Raise awareness and educate shareholders and financial institutions; developing special tools (computational models) to estimate the costs of climate change impacts for businesses and the costs of their adaptation practices;	resilience; financial security; CCA;	cross-regional		climate-related		multiscope	social; economic;	no	Greece, Romania, Cyprus, Bulgaria	already implemented	already validated and demonstrated		Piraeus Bank, Tecsis and IVAX Greece quantified risks and opportunities deriving from climate change. Trained the Bank's personnel to comprehend these issues, investigated how different businesses could adapt to such changes, disseminated this information and provided assistance to the business community by using the Bank's extensive network of branches.	medium	GB - non-specific hazards and urban/territorial scale	CCA; Banks; business; climate risk; market opportunities; training	https://climate-adapt.eea.europa.eu/metadata/case-studies/financial-institutions-preparing-the-market-for-adapting-to-climate-change-2011-climatec
UNABO_d_CH8	Cow-EFCO	Climate Change - Adapting to The Impacts	Interreg IVB - NRP	01/01/2009 - 28/02/2011	developed and put into practice by the project	Phone-based early warning system	resources; technologies; personal data (localization) disclosure	funds availability; public acceptability; confidentiality regulation; system regulation; legislative barriers;	Multi-hazard early warning systems utilise various media and communication tools to inform the public about impending hazards and provide guidance on the precautions to take. It also helps initiating evacuations more efficiently.	use of social media and phones as early warning system; improve citizens security;	development of apps or tools;	CCA; DRM; security; resilience; preparedness;	multiscope	non-specific scale	climate-related		multiscope	social; environmental; economic	no	Sogn og Fjordane, Norway	already implemented	already validated and demonstrated		the project demonstrated that modern warning system technology can be combined with existing infrastructure and organizational patterns to enable local authorities to issue population warnings in a cost-effective and sustainable way.	high	GB - non-specific hazards and urban/territorial scale	mobile phone; crisis management; DRM; CCA; early warning system; emergency response; evacuation; first response; location based; population based;	https://climate-adapt.eea.europa.eu/metadata/case-studies/mobile-based-approach-to-early-warning-system-in-sogn-og-fjordane-norway
UNABO_d_CH9	CIRCLE-1	Climate Impact Research & Response Coordination for a Larger Europe - 2nd generation	ART	01/05/2010 - 30/04/2014	developed and put into practice by the project	heat heat and UV alert system	resources; installation of sensors; targeted policies; institution cooperation	funds availability; involvement of local and national media; governance and stakeholder cooperation	when extremely hot weather is predicted a heat wave and UV protocol is set in motion. The alert reaches citizen and institutions through different channels (social media, city homepage, mail delivery to users,)	use a mix of soft measures to predict the events and inform the population of the alert	installation of the warning system; definition of the security protocol; involve and raise awareness in the citizens of the system;	CCA; resilience; security; DRM;	city	multihazards	heatwaves; wildfire;	multiscope	social; environmental;	no	Budapest, Hungary	already implemented	already validated and demonstrated		The benefits in life savings, preparedness, reactiveness of citizens and institution outweighed the costs every time the alert was activated	high	GB - specific hazards and urban/territorial scale	Capacity building; UV alert system; forest fires; heat alert system; information dissemination; participation; prevention; preparedness; DRR; CCA;	https://climate-adapt.eea.europa.eu/metadata/case-studies/budapest-hungary-drill-during-the-impacts-of-urban-heat-waves-and-forest-fires-with-alert-measures
UNABO_d_CH10	CIRCLE-1	Climate Impact Research & Response Coordination for a Larger Europe - 2nd generation	ART	01/05/2010 - 30/04/2014	developed and put into practice by the project	Smart Sun Educational Programme	targeted policies; cooperation among several municipal bodies;	funds availability; reaching citizens; time; reaching companies; institutions; school managers;	Under the Programme the different vulnerable groups (e.g., infants and their parents, youngsters, old people and ill people) are made aware of the harmful effects of heat waves and high solar activity on the human body, as well as of the simple and effective measures on how to protect themselves and take care of other people	make citizens aware of the risks, protection measures, nothing rights	meetings in schools, work environments to aware and train people, stakeholders/both citizens/governance meeting;	CCA; resilience; security; DRM;	city	multihazards	heatwaves; wildfire;	multiscope	social; environmental;	no	Budapest, Hungary	already implemented	already validated and demonstrated	app. 4 (3.000) uses	The benefits in life savings, preparedness, reactiveness of citizens and institution outweighed the costs every time the alert was activated	high	GB - specific hazards and urban/territorial scale	Capacity building; UV alert system; forest fires; heat alert system; information dissemination; participation; prevention; preparedness; DRR; CCA;	https://climate-adapt.eea.europa.eu/metadata/case-studies/budapest-hungary-drill-during-the-impacts-of-urban-heat-waves-and-forest-fires-with-alert-measures

1/6/R1_2_CR1	CORFU	Collaborative Research on Flood resilience in Urban areas	RFT	01/10/2010 - 30/06/2014	collected and classified by the project	Assess Maturity Level	stakeholder and institutions cooperation	time, stakeholder cooperation,	The method is based on evaluation of maturity of an individual flood risk management framework and view towards full integration and implementation within urban system. The principle is to compare elements in the different frameworks with a reference level which characterizes the complexity and the efficiency of the implemented flood risk management strategy or measure.	determine preparation of stakeholders and bodies, cooperation and integration of risk awareness in the urban system,	stakeholder meeting to determine the maturity level	resilience, security, DRM1	city		flooding		multiscale	social, cultural, economic, environmental	no	Barcelona, Spain; Beijing, China; Dhaka, Bangladesh; Hamburg, Germany; Mumbai, India; Nice, France; Taipei, Taiwan;	already implemented	already validated and demonstrated		The maturity level evaluation allowed to detect gaps in the current institution coordination and improve them.	medium	CB - specific hazards and urban/territorial scale	stakeholders; maturity level; preparedness; DRM1 flood; prevention; bodies coordination;	http://www.corfu7.net/Project/
1/6/R1_2_CR2	ESPONSES	Enhancing risk management partnerships for catastrophic natural disasters in Europe	RFT	01/11/2012 - 30/11/2014	developed and put into practice by the project	Multi-Sector Partnership (MSP) for managing DRR	agreements	time, agreements, institution cooperation, governance cooperation	Involve a mix of partners from the public and private sectors and civil society organizations to reduce the risk from natural hazards	improve the way that different institutions and sectors (jointly) cooperate to develop and implement DRR measures,	long-term planning, inclusion of private and public sectors, generation of an operational framework,	resilience, DRR, DRM1, security,	city	climate-related	multiscale	social, cultural, economic, environmental	yes	London, UK; Rotterdam, Netherland; Austrian Alps, Austria; Santander, Portugal; Guar River Basin, Spain;	already implemented	already validated and demonstrated		Project results show MSPs have the potential to significantly improve disaster risk management.	medium	CB - non-specific hazards and urban/territorial scale	insurance; financial company; DRR; DRM1; prevention; risk assessment; risk reduction; bodies coordination;	https://www.preventweb.net/files/globalplatform/entry,1030_ESPONSES_Final_enhancing_risk_management_partnerships_summary_report.pdf
1/6/R1_2_CR3	ESPONSES	Enhancing risk management partnerships for catastrophic natural disasters in Europe	RFT	01/11/2012 - 30/11/2014	developed and put into practice by the project	Agent Based Model (ABM)	resources,	stakeholders cooperation,	Agent Based Models (ABM) can be used to characterize different stakeholders in a cost sharing arrangement.	Simulation of the risk in an ABM can be used to assess the effect of different risk sharing options, which encourage a cost risk reduction.	simulation models	risk assessment, DRR, DRM1, security,	city	climate-related	multiscale	social, economic, environmental	yes	Rotterdam, Netherland; London, UK;	already implemented	already validated and demonstrated		The results show that tailored, people-centred, flood risk communication can be significantly more effective than the common approach of top-down government communication	medium	CB - non-specific hazards and urban/territorial scale	insurance; financial company; DRR; DRM1; prevention; risk assessment; risk reduction; bodies coordination; ABMs;	https://www.preventweb.net/files/globalplatform/entry,1030_ESPONSES_Final_enhancing_risk_management_partnerships_summary_report.pdf
1/6/R1_2_CR4	STAR-FLOOD	Strengthening And Redesigning European FLOOD risk practices Towards appropriate and resilient flood risk governance arrangements	RFT	01/10/2012 - 31/03/2014	developed and put into practice by the project	Spatial planning tools to prevent flood; Water Assessment + Signal Areas	resources; targeted policies; time, water management decisions	funds availability; multi-institution cooperation	The main goal is to keep under control the paved and impervious land surfaces. The Water Assessment tool is an obligation for authorities to ask advice from the water manager on the impact of a permit, plan or programme on the water system. Signal areas are mainly areas with a 'construction' destination (e.g., residential) in flood-prone areas that must adopt flood-proof measures.	developing Spatial Planning tools to be adopted by governance in cooperation with institutions to prevent future flooding.	development of targeted policies, institution and governance agreements	risk assessment, DRR, security, urban planning,	city	flooding	multiscale	environmental, social, economic	no	Flanders, Belgium	already implemented	not totally documented but promising and inspiring			medium	CB - specific hazards and urban/territorial scale	spatial planning; urban planning; DRR; risk reduction; CCA; soil; water soil; governance; institution; policies;	https://www.starflood.eu/starflood/results-science-practice
1/6/R1_2_CR5	I-REACT	Improving Resilience to Emergencies through Advanced Cyber Technologies	H2020	01/06/2014 - 31/05/2016	developed and put into practice by the project	use of a targeted mobile app and social media	mobile app, download of the app, localization activated, resources, skilled staff,	funds availability, skilled staff,	The project validated the use of targeted mobile apps and social media during emergency phases. The app allows citizens to report events and natural hazards and perform an initial validation of community reports. To involve as many people as possible in the system, the application features several fun quizzes and an award program. The application is also a powerful tool to alert citizens to possible risks by providing them with emergency information.	use of new technologies during the emergency phase	development/launch and of the app, stakeholders training	DRR, DRM1, CCA, resilience, planning, security,	city	climate-related	multiscale	social, cultural, economic, environmental	yes	Zagreb, Croatia; Alessandria, Italy; Lisbon, Sth. Barcelona, Spain; Helsinki, Finland; Turin, Italy; Venice, Italy;	already implemented	already validated and demonstrated		The system, after stakeholder's feedback in implementation case studies, was revised and tested in the demonstration tests. The I-REACT app was then implemented and shared.	high	CC - non-specific hazards and building/district scale	DRR; CCA; DRM1; mobile app; new technologies; social media; stakeholders; community engagement; crowdsourcing; risk management system;	http://project.i-react.eu/documentation/
1/6/R1_2_CR6	SUVAR	Sustainable heritage management of Vrtkovnaya Region	Interreg V-A Slovakia-Hungary	01/06/2016 - 30/09/2020	developed and put into practice by the project	Public-private participatory policy-making model for tourism development, management and promotion	resources, cooperation of local authorities;	cooperation of local authorities;	The GP aimed at increase public awareness of the area, through social media channels to boost local economy through tourism and consequently further the management and development of the area.	increase tourism of the area.	enhance tourism activities and attractiveness of the offer; advertisement on social media channels; organising new events.	management, economy;	district	non-specific hazard	multiscale	social, economic,	no	Lake Derg, Ireland	already implemented	already validated and demonstrated	204 €	The tourism boost was worth 10m € to the local economy. This capital can be advanced to new resources for the area management.	low	CC - non-specific hazards and building/district scale	management; economy; social media; tourism;	https://www.interreg-danube.eu/news-events/news/2020/06/30/project-partnership-meeting-in-vrtkovnaya-region
1/6/R1_2_CR7	SUVAR	Sustainable heritage management of Vrtkovnaya Region	Interreg V-A Slovakia-Hungary	01/06/2016 - 30/09/2020	developed and put into practice by the project	Gather baseline data about natural and built heritage	time; funds	time; funds	The practice aimed at gathering a data baseline for the river, natural and built heritage as its study area available. The inventory will serve for implementing natural and cultural heritage policies.	generate an inventory database on which develop management strategies and planning.	undertaking comprehensive study and data gathering;	resilience, planning;	cross-regional	non-specific hazard	multiscale	cultural, social, economic, environmental	no	River Suir, Ireland	already implemented	already validated and demonstrated	€21,000-€24,000 per year	Each year new findings are presented, e.g. in 2016 almost 300 monuments were recorded along the study area of which only 39 had been previously recorded at national level. The ecological information and habitat mapping is building up a comprehensive picture of the River Suir which has multiple uses.	low	CD - non-specific hazards and urban/territorial scale	management; inventory; data gathering; natural heritage; built heritage; monuments; ecological information; habitat mapping; river;	https://www.interreg-danube.eu/news-events/news/2020/06/30/project-partnership-meeting-in-vrtkovnaya-region
1/6/R1_2_CR8	ESPOSVERK	More carbon reduction by dynamically monitoring energy efficiency	Interreg Central Europe	01/01/2017 - 31/12/2021	collected and classified by the project	Green bonds - Financing climate friendly investments projects	investitors, time;	investitors, time;	Green Bonds raise funds from fixed income investors to support lending for investment projects located in Sweden that seek to mitigate climate change or help adapt to it. The aim is to raise funds to finance new projects.	raise funds; accelerate sustainable investments;	find investors, development of projects to submit to investors;	financing, planning;	cross-regional	non-specific hazard	multiscale	economic, environmental,	no	Ostra Hellesvarnga, Sweden	in progress	already validated and demonstrated		250 projects have been approved 35 millions Euro. The procedure to apply is simple and has a straight forward option for applicants. Strong potential pipeline, due to investment friends and green aggregation model. Results by the end of 2018: 14 GWh energy savings, 120 GWh reduced, 30'12 GWh 965, 439000 t avoided CO2e emissions, 10000 t reduced CO2e emissions.	low	CD - non-specific hazards and building/district scale	planning; green bonds; sustainable planning; sustainable building; investors; finance; investment; green finance;	https://www.interreg-danube.eu/news-events/news/2019/03/05/project-partnership-meeting-in-vrtkovnaya-region
1/6/R1_2_CR9	MEMCOAST	Management of heritage in coastal landscapes	Interreg Central Europe	01/06/2016 - 30/09/2018	collected and classified by the project	Digital platform for CH	resources; time; skilled staff	time; funds	a website that tells real time history through films, photos and text. The stories are linked to their geographical position with digital maps. The platform aims to deliver high quality content and to cover a growing geographical scope. However, the museum has neither the resources nor knowledge to produce all content.	maintain interest of stakeholders, investors, users with updated contents	development of the platform	resources, data	region	non-specific hazard	multiscale	social, economic, environmental	no	Higher Up England, Norway	already implemented	already validated and demonstrated	10 000 EUR/year	Social: Used by students and local schools. Here user analysis is needed in order to proper estimate the social impact. Cultural: Used by the regional public authorities as a support to raise awareness amongst policy makers on specific coastal landscape of high value.	low	CD - non-specific hazards and urban/territorial scale	data platform; tourism; awareness; landscape; cultural heritage; maritime; coastal heritage;	https://www.interreg-danube.eu/news-events/news/2019/03/05/project-partnership-meeting-in-vrtkovnaya-region
1/6/R1_2_CT0	ELETURBO	Knowledge-based approach to develop a cost/Time of Risk prevention	RFT	01/01/2011 - 31/12/2013	developed and put into practice by the project	EWS advanced to several recipients	authorities agreements, coordination planning,	stakeholders cooperation, planning,	EWS alerts should not be received only by one ranked person but also by many different recipients (Civil Protection, managers of the areas, security bodies...) and through different channels (SMS, email, ring alerts)	ensure information is properly transmitted and received	plan who should receive the alert and how	DRM1 security, preparedness, response phase, EWS,	city	climate-related	multiscale	social, economic,	no	Zurich, Alpine catchments; Danube, Many countries Trans-boundary large river; Barcelonette, France; Carlisle, United Kingdom; Sala-Isonzo, Slovenia & Italy; Somerset, United Kingdom;	already implemented	already validated and demonstrated	n.a.	n.a.	medium	CB - specific hazards and urban/territorial scale	floods; storm; cloudburst; water related hazards; DRM1; EWS; stakeholders; alert; response phase; preparedness; coordination;	http://www.balkanlake.net/results
1/6/R1_2_CT1	ELETURBO	Knowledge-based approach to develop a cost/Time of Risk prevention	RFT	01/01/2011 - 31/12/2013	developed and put into practice by the project	ensure a unique information provided by EWS	resources; coordination,	stakeholders and providers cooperation, planning,	The difficulty EWS adds to the potential to improve robust decision-making is also linked to the overwhelming sources of information and product many users are accustomed to which in turn prevent them to prefer and even consult EWS information. Stakeholders and providers should work together to define and effective strategy to use information from EWS.	define alarms easy to understand and use for CPAs; final goal is to use EWS in decision-making	ensure EWS providers define measures unique and easy to be used by CPAs and stakeholders;	DRM1 security, preparedness, response phase, EWS,	city	climate-related	multiscale	social, economic,	no	Zurich, Alpine catchments; Danube, Many countries Trans-boundary large river; Barcelonette, France; Carlisle, United Kingdom; Sala-Isonzo, Slovenia & Italy; Somerset, United Kingdom;	already implemented	already validated and demonstrated	n.a.	n.a.	medium	CB - specific hazards and urban/territorial scale	floods; storm; cloudburst; water related hazards; DRM1; EWS; stakeholders; alert; response phase; preparedness; coordination; information;	http://www.balkanlake.net/results
1/6/R1_2_CT2	ELETURBO	Knowledge-based approach to develop a cost/Time of Risk prevention	RFT	01/01/2011 - 31/12/2013	developed and put into practice by the project	EWS providers and stakeholders communication	resources, stakeholders acceptability	resources, stakeholders acceptability	allowing forecast providers to engage with their users (stakeholders) and to receive true EWS are used and why should be relied	make sure stakeholders understand how EWS work and rely on them to integrate them information in long time planning	providers and stakeholders meetings	DRM1 security, preparedness, response phase, EWS,	city	climate-related	multiscale	social, economic,	no	Zurich, Alpine catchments; Danube, Many countries Trans-boundary large river; Barcelonette, France; Carlisle, United Kingdom; Sala-Isonzo, Slovenia & Italy; Somerset, United Kingdom;	already implemented	already validated and demonstrated	n.a.	The GP was proven valid especially in the Danube case study in which stakeholders did not use the information received from EWS. After communicating with providers the data were integrated and used for planning	medium	CB - specific hazards and urban/territorial scale	floods; storm; cloudburst; water related hazards; DRM1; EWS; stakeholders; alert; response phase; preparedness; coordination; information;	http://www.balkanlake.net/results
1/6/R1_2_CT3	ELETURBO	Knowledge-based approach to develop a cost/Time of Risk prevention	RFT	01/01/2011 - 31/12/2013	developed and put into practice by the project	policies integrating uncertain information from EWS	resources; targeted policies;	resources; time; planning; policies bounded to a certain level of risk;	In some cases e.g. flood prone areas EWS alerts are frequently activated also if no disaster is about to happen. This could lead to a money on the system from CPAs and managers. Targeted policies should take into consideration actions to be performed in case of uncertain information.	take into account uncertainty to generate more conscious decisions	policies; measures planning	DRM1 security, preparedness, response phase, EWS,	city	multihazards	floods; storm;	multiscale	social, economic,	no	Zurich, Alpine catchments; Danube, Many countries Trans-boundary large river; Barcelonette, France; Carlisle, United Kingdom; Sala-Isonzo, Slovenia & Italy; Somerset, United Kingdom;	already implemented	already validated and demonstrated	n.a.	n.a.	low	CB - specific hazards and urban/territorial scale	floods; storm; cloudburst; water related hazards; DRM1; EWS; stakeholders; alert; response phase; preparedness; coordination; information;	http://www.balkanlake.net/results
1/6/R1_2_CT4	PERPETUATE	Performance-based approach to the earthquake protection of cultural heritage in European and Mediterranean countries	RFT-09/2009/BA/RFT	01/01/2010 - 31/12/2013	developed and put into practice by the project	displacement-based approach for vulnerability assessment of CH	resources; monitoring and inspection technologies; skilled staff	funds availability; expertises cooperation; skilled staff availability	Seismic performance-based assessment (PBA) of an existing building checks if the construction is able to fulfill some selected performance levels (PLs) in case of occurrence of properly defined earthquake hazard levels, in terms of annual rate of exceedance (or return period TR).	non-dynamic properties of a building exposed to a dynamic phenomenon such as earthquake	development of non-linear dynamic analysis, design of a virtual model, Nonlinear Static Analysis (pushover), Capacity Spectrum Method (CSM), Incremental Dynamic Analysis (IDA)	resilience, security,	multiscale	building, district,	earthquakes	multiscale	cultural, social, economic,	yes	Larnca, Italy; L'Aquila, Italy; Rhodes, Greece; Algiers, Algeria; Ljubljana, Slovenia;	already implemented	already validated and demonstrated		A low vision it is possible to preserve monuments from ultimate limit states without resource other versions, by improving the displacement capacity rather than stiffness and strength	medium	CB - specific hazards and building/district scale	earthquake; dynamic analysis; virtual model; ultimate limit states; DR; DRM1; preservation; masonry buildings; MS; performance-based assessment; pushover analysis;	Lagomarsino S., "PERPETUATE project guidelines for the seismic performance-based assessment of cultural heritage assets" https://cordis.europa.eu/project/id/184619/reporting

SNAR1_d_CT1	LISVIA (T1)	Risk Mitigation for Earthquakes and Landslides	RPA - SATTERV	01/06/2004 - 31/08/2007	developed and put into practice by the project	simulating earthquake scenario	data availability (historical and environmental considerations: geotechnical hazard, properties of the source and overall methods) resources: skilled staff	funds availability: skilled staff: advanced technology		to define ground-shaking hazard associated with particular scenario events, defined as earthquakes with a given magnitude and location, taken to be the worst event which would take place with a given return period, 50, 100 or 500 years	use of modelling software to provide strong quantified statements about the benefits and costs of a range of possible mitigation actions, to support decision making by city and regional authorities for scenario risk mitigation strategies	model design	resilience; security; preparedness	city		earthquakes		multihazard	social; economic; environmental	yes	Lisbon, Portugal	already implemented	already validated and demonstrated	n.a.	According to the final application, either the mean or the worst scenarios might be used. (for instance, in Lisbon area, the worst case was selected with purpose of generating precautionary scenarios only). The choice depends on the decision of the local administrators, the sensibility to the earthquake phenomena and above all, the level of the seismicity of the area.	medium	LU - specific hazards and urban/territorial scale	earthquake; seismic vulnerability; earthquake simulation; preparedness; worst case scenario; visual model;	G. Zonno, A. Carvalho, D. Karababidou, A. Akinci, A. Campos Costa, E. Codina, G. Cultrera, F. Fasce, V. Pereira and M. Cocco "Simulating Earthquake Scenarios in the European Project ECLIPSE: The Case of Lisbon"
SNAR1_d_CT2	ECLIPSE	A pan-European Framework for strengthening Critical Infrastructure resilience to climate change	IUCN	01/06/2015 - 30/09/2018	developed and put into practice by the project	use of Critical Infrastructure Resilience Platform	resources; climate data availability;	cooperation of different level of governance;		visualise the potential changes of climate variables over the CI network	gain a better understanding of the potential impacts of climate change on CI	risk analysis: definition of useful indicators; CI operators workshops;	ERM; CCA; CI; risk analysis;	city		multihazards	floodplains; Coastal flow; flood;	multihazard	social; economic; environmental	yes	Provence Alpes Côtes d'Azur Region, France; Turkey, UK;	already implemented	already validated and demonstrated	n.a.	The consequences of climate change to the resilience of their assets and actively helped decision makers visualise their future investments and allowed them to prioritise adaptation options.	medium	LU - specific hazards and urban/territorial scale	risk analysis; risk assessment; Coastal flow; floodplains; ERM; CI;	http://www.eclipse-project.eu/sites/default/files/eclipse-case-study-1/
SNAR1_d_CT3	ECLIPSE	A pan-European Framework for strengthening Critical Infrastructure resilience to climate change	IUCN	01/06/2015 - 30/09/2018	developed and put into practice by the project	multihazard risk assessment	resources; data availability;	cooperation of different level of governance;		definition of a climate change risk assessment methodology on CI in different steps	Understand each CI organisation's assets and operations; Define the climate thresholds for each asset (below the climate thresholds for each asset);	Collect the current procedures dealing with prevention, planning and management of emergencies; Collect data concerning previous climate events which impacted their respective networks;	ERM; CCA; CI; risk analysis;	city	climate-related	multihazards	social; economic; environmental	yes	Apulian Area, Cyprus	already implemented	already validated and demonstrated	n.a.	CI operators found that conducting risk analysis of high-impact low probability events useful, particularly for insurance purposes. There does need to be more coordination between the operators of the area and the emergency responders so that the CI operators are better prepared in the event of high-impact low probability events.	low	LU - specific hazards and urban/territorial scale	risk analysis; risk assessment; climate-related hazards; ERM; CI;	http://www.eclipse-project.eu/sites/default/files/eclipse-case-study-2/
SNAR1_d_CT4	BESIN	Climate Resilient Cities and Infrastructures	IUCN	01/01/2015 - 31/12/2018	developed and put into practice by the project	SVIMA (Impact and Vulnerability Analysis of Vital Infrastructures and Built up Areas) methodology	relevant indicators; data availability;	time; resources;		SVIMA is a methodology for conducting a risk based assessment of an urban area's vulnerability to consequences of climate change.	identify geographical hotspots of vulnerability to assess what impact on people can be expected; facilitate the understandment of cause-effect relationship of climate changes; provide valuable input for climate change adaptation plans;	specification of hazard-exposure impact chains; virtual model design; definition of indicators; presentation of the assessment methodology to political level	resilience; planning; CCA; security;	city	climate-related		multihazards	social; economic; environmental	yes	Bilbao, Spain; Bratislava, Slovakia	already implemented	already validated and demonstrated	n.a.	Definition of impact chains and quality vulnerability assessment of the areas of interest. Though, both case studies highlighted the fact that the result was considered too coarse for planning specific adaptation measures (later implemented but with a great effort).	low	LU - non-specific hazards and buildings/district scale	vulnerability assessment; risk assessment; climate related hazard; impact chains; governance; CCA; resilience; security;	https://www.bcin.ca/resources/iclei-canada/
SNAR1_d_CT5	PLACARD	Platform for Climate Adaptation and Risk reduction	IUCN	01/06/2015 - 31/05/2020	collected and classified by the project	implementation of a comprehensive Climate Risk Management (CRM) approach	time; funds; cooperation of different level of governance;	time; funds; cooperation of different level of governance;		evaluation of climate-risk councils at different governance levels (sub-national, national and trans-national) and stakeholders in to facilitate climate resilient decision making at the intersection of DRR and CCA	development of targeted policies including different level of governance;	installation of climate risk councils at different levels; engagement of different governance parties;	resilience; security; CCA; DRR; ERM;	cross-regional	climate-related		multihazards	social; economic; environmental	no	Lisbon, Austria; London, UK;	in progress	already validated and demonstrated	n.a.	At the national level, a scoping of the actor space, including relevant roles and responsibilities for private and public actors, was conducted. At the local level again for the city of Lisbon, stakeholder mapping was undertaken as part of an innovative role-playing exercise, which focused on formulating an aligned understanding on how local roles, rules and possible actions should be shared between multiple related actors. Both pilot exercises were conducted.	medium	LU - non-specific hazards and urban/territorial scale	CCA; DRR; ERM; governance; ERM; climate change scenario; targeted policies;	https://www.placard-network.eu/sites/default/files/2020-11-10/Deliverable_5.1-Lessons%20learned_governance
SNAR1_d_CT6	PLACARD	Platform for Climate Adaptation and Risk reduction	IUCN	01/06/2015 - 31/05/2020	collected and classified by the project	cross-sectorial collaboration	targeted policies; agreements;	development of agreements, reach and involve private partners; high degree of stakeholder preparation; time and perseverance;		demonstrate climate risk personalities, traditionally a public responsibility as different administrative levels, to the local level and include the wide range of private actors.	involve private actors in DRR process; engagement of cross sectoral collaborations; realistic view of climate-related risks;	development of agreements; reach private enterprises; reach citizens;	resilience; security; CCA; DRR; ERM;	city	climate-related		multihazards	social; economic; environmental	no	London, UK;	already implemented	not totally documented but promising and inspiring	n.a.	Stakeholders raised the importance of the bottom-up/top-down approach to support planning and decision-making, as well as the benefit of looking at the problem of resilience to climate change through a number of perspectives.	medium	LU - non-specific hazards and urban/territorial scale	CCA; DRR; ERM; governance; ERM; climate change scenario; targeted policies; public-private partnership; private actors; stakeholders;	https://www.placard-network.eu/sites/default/files/2020-11-10/Deliverable_5.1-Lessons%20learned_governance
SNAR1_d_CT7	PLACARD	Platform for Climate Adaptation and Risk reduction	IUCN	01/06/2015 - 31/05/2020	collected and classified by the project	financing effective financing	agreements time; stakeholder cooperation;	agreements; time; commitment;		encourage the use of innovative financing instruments at various scales to enable the integrated CCA and DRR policies	integrate climate finance and risk transfer mechanism in policies, to boost immediate post-event actions;	leverage climate insurance funds; engage cooperation with insurance companies; forecast based financing; CI green bonds;	resilience; financial security; CCA;	cross-regional		climate-related		multihazards	social; economic;	no		in progress	already validated and demonstrated	n.a.	Several countries around Europe already integrated these financial security measures in their policies for forthcoming events, enabling financial security measures.	high	LU - non-specific hazards and urban/territorial scale	CCA; DRR; financial security; insurance; insurance companies; green bonds; resilience;	https://www.placard-network.eu/sites/default/files/2020-11-10/Deliverable_5.1-Lessons%20learned_governance
SNAR1_d_CT8	PLACARD	Platform for Climate Adaptation and Risk reduction	IUCN	01/06/2015 - 31/05/2020	collected and classified by the project	Risk governance as Focused collaboration	time; funds; different level of governance cooperation; transnational policies and agreements;	time; funds; deep level of bottleneck cooperation; governance; very challenging to build up a transnational effective working group;	Development of a strong transnational and macro-regional collaboration between CCA and DRR with a joint focus on current and future risks	strengthen transnational and macro-regional collaboration in the fight against CC;	development of targeted policies; distribution and governance agreements;	resilience; DRR; CCA; ERM;	cross-regional		climate-related		multihazards	social; economic; environmental	no	Alp Region (Austria, France, Germany, Italy, Slovenia, Liechtenstein and Switzerland)	in progress	already validated and demonstrated	n.a.	The working group managed to use the pre-existing structures and regional cooperation, enhancing their level of interaction and planning. They also managed to have a more comprehensive view of region projects to interchange information and avoid overlapping.	high	LU - non-specific hazards and urban/territorial scale	CCA; DRR; DRM; governance; DRM; climate change scenario; targeted policies;	https://www.placard-network.eu/sites/default/files/2020-11-10/Deliverable_5.1-Lessons%20learned_governance
SNAR1_d_CT9	PLACARD	Platform for Climate Adaptation and Risk reduction	IUCN	01/06/2015 - 31/05/2020	collected and classified by the project	Social Network Analysis: Stocktaking and Social Network Analysis as tools to enhance CCA & DRR innovations	resources; skilled staff; funds; time;	skilled staff; funds; time;	Identification of the actors in CCA & DRR networks, the network properties, and make use of this information to strengthen their interactions and encourage aligned resilience solutions	identify the key actors of DRR and improve their communication	understand a clear overview of each actor and activities involved; Analysis of the CCA and DRR network; cross-relationships; implementation of the network knowledge in practice;	resilience; CCA; DRM; governance;	multinatio	city; regional; cross-regional;	climate-related		multihazards	social; economic;	no	Germany, Italy, Switzerland and the United Kingdom	in progress	already validated and demonstrated	n.a.	The network analysis confirmed that governmental actors have a central role in national CCA / DRR networks. Further, in many cases the same actors occupied the top places in the ranking of more than one of the calculated SNA metrics, which highlights the role of key actors in the network.	high	LU - non-specific hazards and urban/territorial scale	CCA; DRM; DRR; network analysis; governance; stakeholders;	https://www.placard-network.eu/sites/default/files/2020-11-10/Deliverable_5.1-Lessons%20learned_governance
SNAR1_d_CM1	PLACARD	Platform for Climate Adaptation and Risk reduction	IUCN	01/06/2015 - 31/05/2020	collected and classified by the project	joint emergency exercises to strengthen collaboration on various levels between CCA and DRR actors	resources; funds; time;	funds availability; resources; time; stakeholders cooperation;	Organisation of joint emergency exercises to explore climate risks, exchange knowledge and jointly prepare for weather anomalies.	strengthen and ensure stakeholder cooperation; define actions;	organising emergency exercises; link analysis to identify cascade effects; stakeholders meetings; definition of key role actors and actions;	resilience; preparedness; CCA; DRR; DRM;	multinatio	city; regional; cross-regional;	climate-related		multihazards	social; economic;	no	Belgium, the Netherlands and Luxembourg	already implemented	already validated and demonstrated	n.a.	The table top exercise has definitely contributed to acknowledging the differences among the national actors and has resulted in some cases in a spin-off of national discussions within the sector. This analysis was useful to jointly discuss what was needed to improve collaboration and mutual communication.	medium	LU - non-specific hazards and urban/territorial scale	CCA; DRM; DRR; emergency exercise;	https://www.placard-network.eu/sites/default/files/2020-11-10/Deliverable_5.1-Lessons%20learned_governance
SNAR1_d_CM2	PLACARD	Platform for Climate Adaptation and Risk reduction	IUCN	01/06/2015 - 31/05/2020	collected and classified by the project	Fostering dialogue and learning on monitoring, reporting and evaluation	time;	time; stakeholders cooperation;	In order to foster such dialogue and learning on CCA, DRR and sustainable development policies and frameworks, a better coordination of the relevant actors and processes, a more effective use of resources and a stronger collaboration among actors working in the different domains are needed	track the performance of activities undertaken to increase adaptation and reduce climate related risks; record the state of knowledge about monitoring and evaluation of adaptation and risk reduction efforts; support iterative adaptation processes;	develop an explicit description of the monitoring and/or evaluation processes and reporting requirements described in the different policies or frameworks and analyse the relevant roles; involvement of diverse actors with different roles such as data holders and providers, data processors, data interpreters, decision makers, private sector, NGOs;	resilience; CCA; DRM; DRR;	city		climate-related		multihazards	social; environmental;	no		already implemented	not totally documented but promising and inspiring	n.a.		high	LU - non-specific hazards and urban/territorial scale	CCA; DRM; DRR; monitoring; reporting; analysis; stakeholder cooperation;	https://www.placard-network.eu/sites/default/files/2020-11-10/Deliverable_5.1-Lessons%20learned_governance

DRR1_1_006	PLACARD	Platform for Climate Adaptation and Risk reduction	4.2020	01/06/2015 - 31/05/2020	collected and classified by the project	Matrix learning approaches through education	Wise funds; active public participation	Wise funds availability; public accessibility	Learning within an institution is critical if it is to achieve its operational goals. A responsive approach to educational needs that recognises the changing organisational landscape will create greater efficiency and maximise resources.	develop an integrated training strategy within organisations or across institutions	blending online technology and face-to-face meetings to build a Community of Practice	resilience; CCA; DRM; DRR	multiscale	city; regional; cross-regional	climate-related		multihazard	social; economic	no		already implemented	already validated and demonstrated	n.a.	A simple web site was created to widen communication. Given a limited set of resources, time and expertise the staff, and the way it was conducted, proved crucial in the success of the development of the planning and subsequent reports on building their diverse resilience to climate change.	high	GD - non specific hazards and urban/territorial scale	CCA; DRM; DRR; emergency meetings; support; community of practice	https://www.preparednetwork.com/knowledge-base/platform-coordination-capacities/	
DRR1_1_007	PLACARD	Platform for Climate Adaptation and Risk reduction	4.2020	01/06/2015 - 31/05/2020	collected and classified by the project	Ecosystem-based Adaptation and Risk reduction	funds; resources; targeted policies; cooperation	funds availability; long-term planning; knowledge;	promote the consideration and use of nature-based solutions in adaptation and risk reduction strategies through enhanced cooperation, dialogues and inter-sector practices and policies.	include into local policies nature-based solutions and sustainable management and conservation practices;	CCA; urban planning	multiscale	city; regional; cross-regional	climate-related		multihazard	social; cultural; economic; environmental	no	Matanzas, CU	already implemented	already validated and demonstrated	n.a.	Nature-based solution adopted in the case study demonstrated flood protection was valid.	high	GD - non specific hazards and urban/territorial scale	CCA; Nature-based solution; innovative nature solution; environment; urban planning	https://www.preparednetwork.com/knowledge-base/platform-coordination-capacities/	
DRR1_1_008	PLACARD	Platform for Climate Adaptation and Risk reduction	4.2020	01/06/2015 - 31/05/2020	collected and classified by the project	Information and knowledge management to foster stronger CCA DRR institutions	resources; agreements;	stakeholders cooperation;	Promotion of a systematic process for sharing data, information and knowledge for CCA and DRR that accelerates learning and collaboration, to make it easier for stakeholders to find, access and use content that is legitimate and relevant to their needs. This can also increase better monitoring, reporting and evaluation processes.	promote stakeholdersinformation data exchanges	development of guidelines to support a cultural shift in sharing data;	CCA; resilience; stakeholders;	multiscale	city; regional; cross-regional	climate-related		multihazard	social; cultural; economic;	no		already implemented	already validated and demonstrated	n.a.	This helped to reduce incidences of redundancy, duplication or siloed working that may arise from a lack of awareness of parallel and complementary work	high	GD - non specific hazards and urban/territorial scale	CCA; sharing data; data platforms; stakeholders cooperation;	https://www.preparednetwork.com/knowledge-base/platform-coordination-capacities/	
DRR1_1_009	PLACARD	Platform for Climate Adaptation and Risk reduction	4.2020	01/06/2015 - 31/05/2020	collected and classified by the project	use knowledge platforms and portals to enhance learning and collaboration	resources; funds; time	resources; time; planning	Knowledge platforms and portals should play a leading role in promoting and supporting learning and collaboration within and between CCA and DRR communities. These online spaces should not serve as repositories of information, but act as connectors of people and knowledge, and as forums for peer-to-peer learning, dialogue and exchange across the two domains.	evaluation of knowledge portals, platforms, websites that focus on providing, collecting and sharing data, information and knowledge	design and implementation of shared platforms, support peer communication and learning;	resilience; DRR; stakeholders;	multiscale	city; regional; cross-regional	climate-related		multihazard	social; cultural; economic;	no		already implemented	not totally documented but promising and inspiring	n.a.		high	GD - non specific hazards and urban/territorial scale	resilience; data platform; new technologies; stakeholders communication;	https://www.preparednetwork.com/knowledge-base/platform-coordination-capacities/	
DRR1_1_010	RESILIENS	Building European Resilience for Critical Infrastructure	4.2020	01/05/17-31/04/20	developed and put into practice by the project	Resilience Management Matrix and Audit toolkit	resources; funds; time; critical assets knowledge;	resources; time; planning;	With the Matrix toolkit, the CI's resilience preparedness is viewed in the totality of different pre-defined system components and interactions. The assessment components and items in the Matrix tool incorporate the two resilience qualities of systems: inherent (functioning during normal operation, non-crisis periods) and adaptive (response flexibility capacity during disaster/disruption processes) capacities.	achieve a holistic resilience measurement and management tool, which can serve a dual function as both a diagnostic tool and as a way of assessing the impact of efforts to support and improve the systems resilience	studying network dimensions and interdependencies between networks	resilience; urban planning; CI; stakeholders;	city		climate-related		multihazard	social; cultural; economic; environmental	no		already implemented	not totally documented but promising and inspiring	n.a.	n.a.	medium	GD - non specific hazards and urban/territorial scale	resilience; risk matrix; toolkit; urban resilience; CI; stakeholders; CI operators;	https://resilens.eu/uploads/2020/03/D1.1.pdf	The Methodology was collected in this document although described as a tool because it can be considered as a GP easily replicable outside the mother project
DRR1_1_011	PLACE	Pan-European Urban Climate Services	4.2020	01/06/2017 - 29/02/2020	developed and put into practice by the project	World Heritage Service	resources; data availability; time	resources availability; skilled staff; time;	creation of an online platform that keeps the managers, tourist organizations and emergency services informed about the occurrence patterns and impacts of extreme weather events.	use a combination of scientific data and methods to to produce quantitative maps and data and create a highly reliable service that is faster and more affordable than ordinary scientific service providers.	bring together data; realisation of a web platform	resilience; DRR; CCA;	city		climate-related		multihazard	social; cultural; economic;	yes	Rome, Italy	already implemented	not totally documented but promising and inspiring	n.a.	Improvement of the accuracy and detail of the city's forecast service, delivering site-specific information to allow for better management of tourist flows between sites. Working with the Special Superintendent of Rome (SANBM) and Rome's Ministry	medium	GD - non specific hazards and urban/territorial scale	resilience; tourists; web platform; meteorological data; forecast;	https://climate-ff.eu/services/pilot-cities/#heritage	The GP collected is to develop web based platform to help managers.
DRR1_1_012	PLACE	Pan-European Urban Climate Services	4.2020	01/06/2017 - 29/02/2020	developed and put into practice by the project	Emergency Planning Service - expert knowledge meets real experience	resources; data availability;	resources availability; skilled staff; time;	Web-based tool to help city planning. The maps include detailed locations and characteristics of the flooded areas, such as economic consequences, impacts on traffic infrastructure, and associated disaster emergency planning needs.	to predict changes in the frequency of extreme rain storms and pluvial floods.	bring together data; realisation of a web platform	resilience; DRR; CCA;	city		multihazards	Rome; Innsbruck; new cities	no	Antwerp, Belgium	in progress	not totally documented but promising and inspiring	n.a.	Using the city's spatially referenced land use data, to create a tool that will be integrated into Antwerp's disaster emergency planning system to create more efficient emergency response to flooding	medium	GD - non specific hazards and building/district scale	resilience; CCA; DRR; climate change; extreme weather events; water related hazards; flood; rain; storm; governance	https://climate-ff.eu/services/pilot-cities/#heritage	The GP collected is to develop web based platform to help managers.
DRR1_1_013	SAFELIS	DEVELOP LIFE CYCLE FOCUS (L) METHOD, DEFINE TOOL (S) METHOD, DEFINE TOOL (S) VARIABILITY	4.2020	01/09/2013 - 31/08/2016	developed and put into practice by the project	Web based Decision Support System (DSS)	resources; data availability; time;	resources availability; funds availability; data availability; skilled staff;	The software tool is an expert system that aids users to identify and prioritise retrofit measures to improve the energy performance of a specific historic district.	help managers to prioritise sustainable retrofitting measures.	bring together data; realisation of a web platform	DRR; DRM; CCA; resilience; planning; security;	city		climate-related		multihazard	economic; environmental; cultural	yes	Santiago de Compostela, Spain;	already implemented	not totally documented but promising and inspiring	n.a.		medium	GD - non specific hazards and building/district scale	resilience; sustainable retrofitting; sustainable solution; historic buildings; Website; web platform;	https://www.safelis.eu/sites/default/files/2017-06-01/2016-01-31-safelis-d1.1-state-of-the-art.pdf	The methodology presented is used in parallel with the web platform developed during the project
DRR1_1_014	ICLR-SESCLIS	Integrated Design and control of Sustainable Construction during Emergencies	4.2020	01/12/2017 - 17/12/2019	developed and put into practice by the project	PEOPLES framework	resources; data availability;	data availability;	The project is developing quantitative and qualitative models to measure the disaster resilience of communities in terms of capital assets such as hospitals and asset classes such as health care facilities.	enhancing disaster resilience; measuring community resilience;	cross data analysis; matrix analysis;	resilience; security; DRM;	city		non-specific hazard		multihazard	social; cultural; economic; environmental	no		in progress	not totally documented but promising and inspiring			low	GD - non specific hazards and urban/territorial scale	resilience; operational framework; security; community; disaster resilience	https://www.researchgate.net/publication/331131176	
DRR1_1_015	STAMBAMENTAG	New STAMBAMENTAG the seismic assessment of built cultural HERITAGE	4.2020	01/09/2019 - 17/06/2019																		in progress									
DRR1_1_016	STORIES	Structural stiffening, risk and interest	4.2020	01/10/2018 - 31/10/2022																		in progress									
DRR1_1_017	SUMBELO	Realistic Assessment of Historical Masonry Bridges under Extreme Environmental Actions	4.2020	01/07/2019 - 31/07/2021																		in progress									
DRR1_1_018	CULTURHERIS	Bricks manufacturing technologies to increase built heritage resilience and to raise common identities of peoples		01/04/2019 - 31/04/2021																		in progress									
DRR1_1_019	ARCH	Advancing Resilience of Historic Areas against Climate-related and other Hazards	4.2020	01/06/2019 - 31/05/2022																		in progress									
DRR1_1_020	APPI-MON	Development of a Decision Support System for Improved Resilience & Sustainable Reconstruction of Historic Areas to Cope with Climate Change & Extreme Events based on Novel Sensors and Modelling Tools	4.2020	01/06/2019 - 31/12/2022																		in progress									
DRR1_1_021	CHIC	Cultural Heritage protection against flood	FP6	01/02/2007 - 30/04/2009																											Information on Cordis non available, web of not active
DRR1_1_022	RISMAR	Strategies and tools for Real Time Earthquake Risk Reduction	6th	01/09/2002 - 30/02/2004																											No Reports on Cordis. Web Site not active
DRR1_1_023	SESCIO	Development of Innovative Techniques for the Improvement of Stability of Cultural Heritage, in particular against protection	5th	01/01/1998 - 30/06/2000																											No Reports on Cordis. Web Site not active
DRR1_1_024	NEWHERI	Seismic Retrofitting Techniques for earthquake protection of cultural heritage	FP6	1/01/2007 - 30/01/2009																											No Reports/Deliverables on Cordis. Web Site not active
DRR1_1_025	RISMAR	Risk of Rubble-mass Masonry Properties Relations. A European Prevention and Management Initiative	4th	1/01/1996 - 31/12/1998																											
DRR1_1_026	MONALI	Monitoring urban subsidence, sinkhole and landslides by robotic scouting	5th	01/01/2000 - 31/09/2001																											No Reports/Deliverables on Cordis. Web Site not active
DRR1_1_027	DPRM2001	The impact of small-scale disaster events on exploration of disaster-related losses, enhancing risk management and learning at the institutional and community level in Italy	4.2020	01/08/2001 - 31/08/2018																											No Reports/Deliverables on Cordis and Web Site
DRR1_1_028	EnvPRO	Increasing Resilience through Earth Observation	FP7	01/01/2013 - 31/12/2014																											No Reports/Deliverables on Cordis and Web Site

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10.3 Annex III – Tools data collection sheet

Complete Excel file available here.

	R&I INITIATIVE INFO					TOOL INFO													TOOL TECHNICALITIES AND REPLICABILITY				GENERAL FIELDS				
PROGRESSIVE CODE	Open call assignment	R&I initiative name	R&I initiative promoters	initiative funding programme	initiative timeframe (date or period)	tool name	tool main objectives	tool promoters/ developers	tool time reference	type of tool (e.g. platform, webtool, methodology, etc.)	tool description and functionality	tool costs (if any) - specify amount (€) and source	tool scale*	if 'multiscale', please specify which ones among those mentioned beside	addressed hazard*	if 'multihazards', please specify which ones among those mentioned beside. If 'other hazards', please add the description of the other	tool scope*	if 'multiscope', please specify which ones among those mentioned beside	limitations and barriers in application of the tool (*)	interoperability requirements (*)	DRM phase (*)	date of update (*)	relevance to SHELTER*	goal/target*	keywords	references (website, publications, etc.)	comments
CROM_a_001		Collection, Standardisation and Attribution of Robust Disaster Event Information	ZAMG - Zentralanstalt für Meteorologie und Geodynamik	KIRAS	2019/11/01-2021/10/31	CASARE	collection, standardisation and attribution of robust disaster event information	Matthias Themeßl		data base	development and function testing of a national disaster and damage data base as a semi-automatized, autonomous technical system enabling the harmonisation and display of disaster, damage and risk data from various sources based on a uniformed standard in order to use it for continued analyses		multiscale	all	multihazards	all	multiscope	all					low	CD - non-specific hazards and urban/territorial scale	standardisation of information		https://www.kiras.at/index.php?id=173&L=0%2F%2Fftp%2Fpub%2Ftemp%5B_new%5D=1205&cHash=56181cc54ede8e88c55787575ba6bf	German language
CROM_a_002		Crisis Management using Multimodal Interaction for Stakeholders and Citizens	AIT - Austrian Institute of Technology	KIRAS	2019/11/01-2020/10/31	CORMSO	crisis management using multimodal interaction for stakeholders and citizens	Mario Drobics		AI	evaluation of the deployment of AI in order to implement new interaction patterns in disaster management and response for addressing unsolved problems in the processing and availability of heterogenous data		multiscale	all	multihazards	all	multiscope	all					low	CD - non-specific hazards and urban/territorial scale	AI, processing and availability of heterogenous data		https://www.kiras.at/index.php?id=173&L=0%2F%2Fftp%2Fpub%2Ftemp%5B_new%5D=1287&cHash=a5d46a5e1000640fed0da8b85b95a52	German language
CROM_a_003		Intelligentes Lageinformatic tsportal zur Unterstützung im Katastrophenmanagement	Technische Universität Graz	KIRAS	2019/11/01-2021/10/31	iLite	intelligent situation information portal for supporting emergency deployment	Clemens Gutschi		information portal	intelligent situation information portal for collecting and processing relevant social media information fir innovative support of emergency forces		multiscale	all	multihazards	all	multiscope	all					low	CD - non-specific hazards and urban/territorial scale	information portal, social media		https://kiras.at/index.php?id=173&L=6848&e_ttnews%5Bt_news%5D=1293&cHash=bb0c15693ccbc1be7a29b0d6a53c3ee67	German language
CROM_a_004		Aerial search & Rescue support and supervision of inaccessible terrain(f)	AIT - Austrian Institute of Technology	KIRAS	2018/10/01-2020/09/30	ARZAS	aerial search & rescue support and supervision of inaccessible terrains	Alexander Prasserstorfer		UAV	reaching an effective and efficient harvest of information in unacessible terrain in real-time by the combined deployment of Unmanned Aerial Vehicles (UAVs), sensors in visible, infrared and multi-spectral spectrum as well as laser scanners		multiscale	all	multihazards	all	multiscope	all					low	CD - non-specific hazards and urban/territorial scale	airborne support		https://kiras.at/index.php?id=173&L=0%2F%2Fftp%2Fpub%2Ftemp%5B_new%5D=1237&cHash=cbaa4f6b8f80aa222d6b42c0ac1308c	German language
CROM_a_005		Multimodale luftgestützte Sensorplattform, innovative Analyse- und Geo-Managementtools zur Katastrophenbewältigung	AeroMap Dreipt AM	KIRAS	2019/01/01-2021/12/31	ARGUS-Plus	multi-modal airborne sensor platform and innovative analyses and geo-magnatism based solutions for disaster management support	Richard Feischl		airborne sensor platform	quick operational integration into an optimal operative as well as tactical 24/7 support vor emergency forces in large scale disaster scenarios		multiscale	all	multihazards	all	multiscope	all					low	CD - non-specific hazards and urban/territorial scale	airborne support		https://kiras.at/index.php?id=173&L=0%2F%2Fftp%2Fpub%2Ftemp%5B_new%5D=1251&cHash=e45ba5986957f7d977cdca4fa81431a8	German language
CROM_a_006		SOCIAL PLATFORM FOR HOLISTIC HERITAGE IMPACT ASSESSMENT	UNIVERSITÀ DEGLI STUDI ROMA TRE	H2020-EU.3.6.3.1.	2020/01/01-2021/12/31	SoPHIA	draft holistic impact assessment model	N.A.		social platform	organized around five main analytical dimensions – social, cultural, economic and environmental impact		multiscale	all	multihazards	all	multiscope	all					medium	CD - non-specific hazards and urban/territorial scale	social platform		https://cordis.europa.eu/project/id/870994	
CROM_a_007		Big Data of the Past for the Future of Europe	ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE	H2020-EU.1.2.1.	2019/09/01-2020/01/29	Time Machine	digitise archives from museums and libraries	Frédéric Kaplan		Search Engine	using Artificial Intelligence and Big Data mining, to offer richer interpretations of our past		multiscale	all	multihazards	all	multiscope	all					medium	CD - non-specific hazards and urban/territorial scale	Time Machine, cultural heritage, big data, Artificial Intelligence, digitisation, motor words, 4D, Augmented Reality	https://cordis.europa.eu/article/id/413116-bringing-museum-history-to-life-with-the-big-data-of-the-past	
CROM_a_008		Emotive Virtual cultural Experiences through personalised storytelling	EKUI SOFTWARE LTD	H2020-EU.3.6.3.1.	2016/11/01-2019/10/31	EMOTIVE	immersive storylines using a range of technologies including virtual reality (VR), augmented reality (AR) and mobile phone apps, to create more 'emotive' cultural site visits	Thea Stefanou		augmented reality	adaptation of advanced immersive technologies, such as augmented reality, combined with storytelling techniques		multiscale	all	multihazards	all	multiscope	all					low	CD - non-specific hazards and urban/territorial scale	emotional, narrative, drama, cultural heritage, historical, virtual reality, artefact, storytelling, augmented reality, museums	https://emotivemuseum.eu/	
CROM_a_009		Meaningful Personalization of Hybrid Virtual Museum Experiences Through Gifting and Appropriation	IT-UNIVERSITETET I KØBENHAVN	H2020-EU.3.6.3.1.	2017/01/01-2019/12/31	GIFT	mobile applications to enhance the experience of a visitor who is physically inside a museum	Anders Sundnes Løvlie		mobile application	provide curators and designers with the tools they need to develop meaningful, interpersonal museum experiences		multiscale	all	multihazards	all	multiscope	all					low	CD - non-specific hazards and urban/territorial scale	museums, mobile applications, digital technologies, virtual museums, cultural heritage	https://gifting.digital/	
CROM_a_010		Empowering reuse of digital cultural heritage in context-aware crossroads of European history	LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY	H2020-EU.3.6.3.	2016/03/01-2019/02/28	CROSSCULT	flexible software services and a toolkit for cultural heritage professionals to develop their own customised applications including profiling, personalisation, association discovery and narrative creation	Ioanna Lykourentzou		mobile applications	The platform hosts four ecosystems offering solutions for the exploration of large multi-thematic venues, for connecting different small/medium sites, for connecting physical and digital cultural items, social media and trending topics and, lastly, for location-aware urban discovery of culture heritage. The platform also integrates a Knowledge Base, which links digital collections across sites.		multiscale	all	multihazards	all	multiscope	all					low	CD - non-specific hazards and urban/territorial scale	cultural heritage, crowdsourcing, reflections, narratives, artefacts, paintings, gallery, archaeological museum, mobile applications, reinterpretations	https://www.crosscult.eu/	
CROM_a_011		Innovative e-environment for Research on Cities and the Media	CINEMATHEQUE ROYALE DE BELGIQUE	H2020-EU.3.6.3.	2016/04/01-2019/03/31	E-Media-Cities	create new approaches to researching historically significant digital content, make European cultural heritage more accessible, and stimulate collaboration between archives and researchers	Daisy Hanegreefs		online platform	state-of-the-art machine learning tool that allows it to analyse uploaded films and photographs and automatically segment the films into shots		multiscale	all	multihazards	all	multiscope	all					low	CD - non-specific hazards and urban/territorial scale	audiovisual, European cities, digital technologies, films, photographs, European cultural heritage, machine learning, history	https://emediacities.eu/	

CRCM_a_012		Pluggable Social Platform for Heritage Awareness and Participation	INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS	H2020-EU.3.6.3.1.	2016/12/01-2019/11/30	PLUGGY	uses social media to help facilitate the sharing of personalised experiences with and knowledge of local cultural heritage	Angelos Amditis		social media	developing open source solutions that developers can use to create a range of social applications. Currently, these include the PLUGGYXD Suite (for creating augmented reality experiences), PLUGGYPlay (for creating guided tours), Games Hunter (for creating interactive games), and Plugtonic Suite (for creating soundscapes)		multiscale	all	multihazards	all	multiscope	all					low	GD - non-specific hazards and urban/territorial scale	social media, social networking, customs, local traditions, augmented reality, virtual museums	https://www.pluggy-project.eu/	
CRCM_a_013		Accessible Resources for Cultural Heritage Ecosystems	VRWI. ZENTRUM FÜR VIRTUAL REALITY UND VISUALISIERUNG FORSCHUNGS- WWBH	H2020-EU.3.6.3.	2016/10/01-2019/12/31	ARCHES	innovative technological solutions to increase access for disabled people to cultural artefacts	Zord Hosna		mobile application	sign language video avatars, tactile artwork reliefs, barrier-free apps for museum visits and games for smartphones and tablets		multiscale	all	multihazards	all	multiscope	all					low	GD - non-specific hazards and urban/territorial scale	museum, access, disabilities co-creating, app, 2.5D, relief, artefacts, printer	https://www.arches-project.eu/	
CRCM_a_014		The Internet Of Historical Things And Building New 3D Cultural Worlds	LIVERPOOL JOHN MOORES UNIVERSITY	H2020-EU.3.6.3.	2015/06/01-2018/11/30	DigiArt	'Internet of connected historical things', available on any web-enabled device	Andy Shaw		platform	By enabling simple and cost-efficient 3D capture of resources, from the big to the small, from full historical sites to handheld artefacts, DigiArt allows the public to access and explore cultural heritage interactively		multiscale	all	multihazards	all	multiscope	all					low	GD - non-specific hazards and urban/territorial scale	DigiArt, 3D, cultural heritage, augmented reality, virtual reality, artefact, archaeological sites, digitisation, museum, models, scanner, internet of historical things	http://digiart-project.eu/	
CRCM_a_015		Advanced VR, iMmersive serious games and Augmented Reality as tools to raise awareness and access to European underwater CULTURal heritagE.	TECHNOLOGIKO PANEPISTIMIO KYPROU	H2020-EU.3.6.3.1.	2016/11/01-2019/10/31	IMMERCULTURE	Immersive technologies such as augmented and virtual reality are being leveraged to make Europe's underwater cultural heritage more accessible.	Dimitrios Skarlatos		3D online platform	Deliver online available 3D models for3D printing at home for creating handicraft toys and puzzles of amphorae and ancient ships in scale in order to enhance hands-on experience, as supported by personalised 3D printing.		multiscale	all	multihazards	all	multiscope	all					low	GD - non-specific hazards and urban/territorial scale	underwater cultural heritage,augmented reality, virtual reality, immersive technologies, Relax, diver, scuba diving	https://immerculture.eu/	
CRCM_a_016		Inclusive Cultural Heritage in Europe through 3D semantic modelling	UNIVERSITÀ DEGLI STUDI DI FERRARA	H2020-EU.3.6.3.	2015/06/01-2019/05/31	INCEPTION	developed enriched 3D models of built and social environments through time, for more engaging interaction with this heritage	Roberto Di Giulio		portable, user-friendly and cost-effective hardware and software instruments for 3D capturing, modelling and analysis, as well as INCEPTION Semantic Web technologies and open-standard platform to creating and sharing understanding between various end-user group	realises innovation in 3D modelling of cultural heritage through an inclusive approach for time-dynamic 3D reconstruction of artefacts, built and social environments		multiscale	all	multihazards	all	multiscope	all					medium	GD - non-specific hazards and urban/territorial scale	semantic web, cultural heritage, 3D models, Virtual Reality, Augmented Reality, Building Information Modelling, design, Archaeological sites, digitising	https://www.inception-project.eu/en	
CRCM_a_017		Archaeological Automatic Interpretation and Documentation of cEramics	UNIVERSITÀ DI PISA	H2020-EU.3.6.3.	2016/06/01-2019/05/31	ArchAIDE	software to identify the archaeological ceramics and store them in a database	Maria Letizia Guarlandi		software tool	The system uses either a recognition model based on the images and decoration on the pottery or a second model based on shape recognition, which helps identify potters types, such as to what vessel the sherd belongs		multiscale	all	multihazards	all	multiscope	all					low	GD - non-specific hazards and urban/territorial scale	pottery, potsherds, excavations, classifying, database	http://www.archaide.eu/	
CRCM_a_018		Integrating Platforms for the European Research Infrastructure ON Heritage Science	CONSIGLIO NAZIONALE DELLE RICERCHE	H2020-EU.1.4.1.2.	2020/04/01-2023/03/31	IPERION HS	establishing and operating an Integrating Activity for a distributed pan-European research infrastructure, opening key national research facilities of recognized excellence in heritage science	N.N.		portal	offering Trans-National Access to a wide range of high-level scientific instruments, methodologies, data and tools for advancing knowledge and innovation		multiscale	all	multihazards	all	multiscope	all					high	GD - non-specific hazards and urban/territorial scale	ERIHS	https://cordis.europa.eu/project/id/871034	
CRCM_a_019		Museums and Community: Concepts, Experiences, and Sustainability in Europe, Latin America and the Caribbean	THE UNIVERSITY COURT OF THE UNIVERSITY OF ST ANDREWS	H2020-EU.3.6.	2016/09/01-2020/08/31	EU-LAC-MUSEUMS	fostering cooperation between museums	Karen Brown		none	joint research projects, non-museum meetings, joint virtual museum		multiscale	all	multihazards	all	multiscope	all					low	GD - non-specific hazards and urban/territorial scale	international relations, Latin America, Caribbean, museums, sustainability,	https://eulacmuseums.net/index.php	
CRCM_a_020		Support to the implementation of the Strategic Research Agenda (SRA) of the Joint Programming Initiative on Cultural Heritage and Global Change (JPI CH)	MINISTERO PER I BENI E LE ATTIVITÀ CULTURALI	H2020-EU.3.5.	2016/01/01-2019/12/31	JPEP2	Develop effective and efficient governance of the alignment of the national research and innovation programmes. - Reinforce common activities on cultural heritage. - Apply quantitative and qualitative KPIs for monitoring on assessing the JPICH alignment process.	N.N.		none	Develop effective and efficient governance of the alignment of the national research and innovation programmes. - Reinforce common activities on cultural heritage. - Apply quantitative and qualitative KPIs for monitoring on assessing the JPICH alignment process.		multiscale	all	multihazards	all	multiscope	all					high	GD - non-specific hazards and urban/territorial scale	JPICH	http://www.jpi-culturalheritage.eu/	
CRCM_a_021		Heritage Resilience Against Climate Events on Site	CONSIGLIO NAZIONALE DELLE RICERCHE	H2020-EU.3.5. and 3.7.	2016/05/01-2019/04/30	HERACLES	provide decision-makers with vital information to help them prioritise cultural heritage investments and act decisively to strengthen the resilience of sites against climate change	Giuseppina Padeletti		ICT platform	The platform collects and integrates multisource information – including satellite imagery of heritage sites – to support informed maintenance and conservation decisions. The HERACLES project brings together information gathered from multiple sources, notably end users, in a kind of crowd sourcing cultural heritage exercise.		multiscale	all	multihazards	all	multiscope	all					high	GD - non-specific hazards and urban/territorial scale	climate change, Gubbio, Heraklion, Crete, Knossos, Rounio, Mediterranean, history, society, civilisation, community, climate change, conservation, archaeology, erosion, platform	http://www.heracles-project.eu/	
CRCM_a_022		Critical Heritages: performing and representing identities in Europe	UNIVERSITY OF NEWCASTLE UPON TYNE	H2020-EU.3.6.	2016/04/01-2019/03/31	CoHERE	provide intellectual, creative cultural and practical instruments (including digital ones) for valorising European heritages and promoting communitarian identities.	Chris Whitehead		none	relational study of productions and experiences of heritage at institutional, social and personal levels, including research into people's activities and attitudes		multiscale	all	multihazards	all	multiscope	all					medium	GD - non-specific hazards and urban/territorial scale	European heritages, European identity, collective memory	https://research.ncl.ac.uk/cohere/	

CROM_e_025		Organizing, Promoting and Making HERitage Re-use through Inclusion, Technology, Access, Governance and Empowerment	VARESKUTATAS (VETROPOLITAN RESEARCH INSTITUTE) RTI	H2020-EU.3.5.6.	2018/06/01-2022/03/31	OpenHeritage	developing and testing an inclusive governance model and a supporting toolbox for the adaptive re-use of cultural heritage assets	N/A		website, database	database of macro- and micro-level research results, connecting systematically collected information on the regulatory framework all over Europe with current heritage re-use practices		multiscale	all	multihazards	all	multiscope	all					medium	CD - non-specific hazards and urban/territorial scale	inclusive governance	https://cordis.europa.eu/project/id/776784	
CROM_e_024		The role of cultural heritage in socio-economic development and preservation of democratic values	SVEUCILISTE U RIJECI	H2020-EU.3.6.3.1.	2019/11/21-2020/07/20	HERitage	organising an international conference entitled "The role of cultural heritage in socio-economic development and preservation of democratic values—HERitage".	N/A		conference	Challenges and opportunities of digital transformations: the role of digital tools in preserving cultural and industrial heritage		multiscale	all	multihazards	all	multiscope	all					high	CD - non-specific hazards and urban/territorial scale	University of Rijeka, Croatian Presidence of the Council of the European Union	https://cordis.europa.eu/project/id/101080020	
CROM_e_025		Global climate change impact on built heritage and cultural landscapes	CONSIGLIO NAZIONALE DELLE RICERCHE	FP6-POLICIES-3.8	2004/06/01-2017/05/31	NOAH'S ARK	- To determine the meteorological parameters and changes most critical to the built cultural heritage. - To research, predict and describe the effects of climate change on Europe's built cultural heritage over the next 100 years. - To develop mitigation and adaptation strategies for historic buildings, sites, monuments and materials that are likely to be worst affected by climate change effects and associated disasters. - To disseminate information on climate change effects and the optimum	N/A		network of tools and a database of information for stakeholders to evaluate threats, run different scenarios and predict the effectiveness of various strategies	prediction of the impact of climate and pollution on cultural heritage and investigation of future climate scenarios on a European scale		multiscale	all	multihazards	all	multiscope	all					high	CB - specific hazards and urban/territorial scale	coordination of emergency reactions, self-preparedness	http://noahsark.isac.cnr.it/	offline (?)
CROM_e_026		EnhaNcing emergency management and response to extreme WeatHER and climate Events	UNIVERSITAT POLITECNICA DE CATALUNYA	H2020-EU.3.7.	2016/06/01-2019/12/31	ANYWHERE	empower exposed responder institutions and citizens to enhance their anticipation and pro-action capacity of response to fast-extreme and high-impact weather and climate events	N/A		platform of early warning products and locally customizable decision support services	implement a Pan-European multi-hazard platform providing a better identification of the expected weather-induced impacts and their location in time and space before they occur. platform will support a faster analysis and anticipation of risks prior the event occurrence, an improved coordination of emergency reactions in the field and help to raise the self-preparedness of the population at risk		multiscale	all	multihazards	all	multiscope	all					high	CB - specific hazards and urban/territorial scale		http://anywhere-h2020.eu/	
CROM_e_027		Culture, Heritage and Identities: Impacts of Climate Change in North West Europe	AARHUS UNIVERSITET	H2020-EU.1.5.2.	2020/11/01-2022/10/31	CHICC	understand the impact of climate-change-driven heritage loss on local communities	N/A		online deepmap	deepmap will collate and demonstrate multidisciplinary, primary and secondary data to interrogate the relationship between climate change, heritage and culture. This open-access resource will be created in-line with a Digital Preservation Strategy to ensure reuse of data for future researchers and varied stakeholder groups		multiscale	all	multihazards	all	multiscope	all					high	CA - specific hazards and building/district scale	Citizen Science, North-West Europe, Minsk, Denmark, Dunkeag, Ireland Bruna, Scotland	https://cordis.europa.eu/project/id/895147	
CROM_e_028		European Research Area for Climate Services	AGENCE NATIONALE DE LA RECHERCHE	H2020-EU.3.5.1.	2016/01/01-2021/08/31	ERA4CS	aiming to boost research for Climate Services (CS), including climate adaptation, mitigation and disaster risk management, allowing regions, cities and key economic sectors to develop opportunities and strengthen Europe's leadership	Philippe Bougeault		"climate information translation" layer	development of a "climate information translation" layer bridging "user communities" and "climate system sciences". It implies the development of tools, methods, standards and quality control for reliable, qualified and tailored information required by the various field actors for smart decisions.		multiscale	all	multihazards	all	multiscope	all					high	GB - specific hazards and urban/territorial scale	climate adaptation, mitigation and disaster risk management,	http://www.jpi-climate.eu/ERA4CS	
CROM_e_029		MAlRine MAnagement and Ecosystem Dynamics under climate change	UNIVERSITETET I OSLO	H2020-EU.1.5.1.	2016/10/01-2019/09/30	MAlRineES	Understanding the complex dynamics of seas and oceans under rapid environmental change with a particular focus on its socio-economic consequences	Joël Durant		training, with a mobility programme facilitating inter-disciplinarity and training modules of transferable skills such as communication	To train a new generation of innovative researchers with interdisciplinary experience and skilled in promoting marine science To a wide audience		multiscale	all	non-specific hazard		multiscope	economic, environmental					low	GB - specific hazards and urban/territorial scale	biodiversity loss, sea/coastal resources use	https://www.mairine-d.uio.no/	
CROM_e_030		Cost Effective Neural Technique for Alleviation of Urban Flood Risk	THE UNIVERSITY OF SHEFFIELD	H2020-EU.3.5.4.	2015/09/01-2018/08/30	CENTAUR	an innovative and cost effective local autonomous sewer flow control system to reduce urban flood risk	Will Shepherd		Real-Time Control (RTC) sewerage systems	RTC system will utilise data driven distributed intelligence combined with local, low cost monitoring systems installed at key points within existing sewer infrastructure. The system will utilise mechanically simple, robust devices to control flow in order to reduce flood risk at vulnerable sites. This system will be informed and governed directly by sensors distributed within the local network, without the need for an expensive hydrodynamic model or real time rainfall measurements		city		floods		multiscope	all					medium	CA - specific hazards and building/district scale	sewage system, flow control device	https://www.sheffield.ac.uk/centaur	
CROM_e_031		IMproving PRedictions and management of hydrological DIsasters	KONINKLIJK NEDERLANDS METEOROLOGISCH INSTITUUT-KNMI	H2020-EU.3.5.4.	2015/10/01-2019/09/30	IMPREX	improve forecast skill of meteorological and hydrological extremes in Europe and their impacts, by applying dynamic model ensembles, process studies, new data assimilation techniques and high resolution modelling	Janet Wijngaard		prototype periodic outlook of multi-sectoral and trans-regional risks for hydrological hazards	periodic hydrological risk outlook for Europe is produced, incorporating the dynamic evolution of hydro-climatic and socio-economic processes		multiscale	all	floods		multiscope	all					high	GB - specific hazards and urban/territorial scale	Climate services, Water, Sectoral climate impacts, Weather forecasting, Climate projections	https://www.imprex.eu/	
CROM_e_032		Coordinated Research in Earth Systems and Climate: Experiments, Knowledge, Dissemination and Outreach	UNIVERSITY OF LEEDS	H2020-EU.3.5.1.	2015/11/01-2020/10/31	CRESCENDO	improve the process-realism and simulation quality of European ESMs in order to increase the reliability of future Earth system projections	Colin Jones		community ESM evaluation tool allowing routine ESM performance benchmarking, process-based ESM evaluation and the analysis of Earth system projections			multiscale	all	multihazards	all	multiscope	all					high	GB - specific hazards and urban/territorial scale		https://www.crescendoproject.eu/	

CRCM_a_053		Oasis Innovation Hub for Catastrophe and Climate Extremes Risk Assessment	POTSDAM INSTITUT FÜER KLIMAFOLGENFORSCHUNG		2017/01/01-2020/10/31	H2020_Insurance	operationalise a system that combines climate services with damage and loss information and provides a standardised risk assessment process that can assess potential losses, areas at most risk and quantify financial losses of modelled scenarios	N.N.		Oasis Loss Modelling Framework	using climate information to support the underwriting of micro-insurance, climate x health and climate x forest asset risk assessment		multiscale	all	multihazards	all	multiscope	all					medium	QB - specific hazards and urban/territorial scale	Europe and Africa, Danube region, Typhoon risk, Farmer risk	https://h2020insurance.oasishub.co/	
CRCM_a_054		Knowledge production, communication and negotiation for coastal governance under climate change	FACULDADE DE CIENCIAS SOCIAIS E HUMANAS DA UNIVERSIDADE NOVA DE LISBOA	FPT-PEOPLE	2014/01/01-2016/12/31	KNOWHOW	improve the capacities of participant institutions and researchers in producing, translating and effectively delivering scientific knowledge to decision makers, with an emphasis on local governments on the coastal zone as key actors in adaptation to global environmental change, particularly climate change	N.N.		capacity building	1) Promote exchange of expertise and experience between partners in modes of research oriented towards the needs of decision makers in the domain of environmental governance. These include all spheres of governance from national to local with a specific focus on municipal government; 2) Develop and test a methodological approach to assess local governments' knowledge needs for coastal adaptation to climate change which is transposable between Europe and Africa; 3) Improve existing capacity of partners to conceptualise and communicate research and research uncertainties in ways that enhance its usability, comprehension and impact; 4) Develop a joint stakeholder oriented transdisciplinary research proposal for a next FP call that will contribute to more effective management of coastal zones in a changing climate		multiscale	all	multihazards	all	multiscope	all					medium	QB - specific hazards and urban/territorial scale	Europe and Africa, coastal regions	https://cordis.europa.eu/project/id/612615	
CRCM_a_055		IMproving Preparedness and Risk mAnagement for flash floods and debrIS flow events	UNIVERSITAT POLITECNICA DE CATALUNYA	FPT-ENVIRONMENT	2009/01/15-2012/11/14	IMPRINTS	contribute to reduce loss of life and economic damage through the improvement of the preparedness and the operational risk management for Flash Flood and Debris Flow (FF/DF) generating events, as well as to contribute to sustainable development through reducing damages to the environment	N.N.		integrated probabilistic forecasting FF/DF system	develop an integrated probabilistic forecasting FF/ DF system as well as a probabilistic early warning and a rule-based probabilistic forecasting system adapted to the operational use by practitioners		multiscale	all	floods		economic						High	QB - specific hazards and urban/territorial scale	crisis preparedness, operational risk management, forecasting	https://cordis.europa.eu/project/id/126555	
CRCM_a_056		Tools, methods And training for CommunITies and Society to better prepare for a Crisis	HELMHOLTZ-ZENTRUM FÜR UMWELTFORSCHUNG GMBH - UFZ	FPT-SECURITY	2014/06/01-2016/04/30	TACTIC	increase preparedness to large-scale and cross-border disasters amongst communities and societies in Europe	N.N.		participatory community preparedness audit	TACTIC will consider studies on risk perception and preparedness (including good practices and preparedness programmes) in order to develop a participatory community preparedness audit enabling communities to assess, impacts in a multi-hazard context, their motivations and capacities to prepare for large-scale and/or cross-border disasters. This forms the basis for developing context sensitive education and training strategies and practices that are embedded in an overarching long-term learning framework (including evaluation procedures) for increasing the overall preparedness of communities and societies across Europe.		multiscale	all	multihazards	terrorism, pandemic, earthquake, flood	multiscope	all					High	QB - specific hazards and urban/territorial scale	Emergency, training, preparedness, cross-border crises.	https://cordis.europa.eu/project/id/608059	
CRCM_a_057		LAndslide Modelling and tools for vulnerability assessment Preparedness and REcovery management	CONSIGLIO NAZIONALE DELLE RICERCHE	FPT-SPACE	2013/01/01-2015/02/28	LAMPRE	Increase GMES limited operational capacity to cope with triggered landslide events and their consequences, in Europe and elsewhere	N.N.		landslide inventory maps (LIM), event landslide inventory maps (ELIM), tools for landslide susceptibility models and maps (LSMM) and for determining the statistics on landslide size (LSize), three dimensional surface deformation models (3DLDM), and landslide road impact models (LRIM)	(i) researching and developing new techniques and products to dynamically integrate satellite/airborne imagery, (ii) designing and using intelligent image processing techniques, (iii) modelling landslide-infrastructure interactions using advanced numerical modelling and ground based thematic information, and (iv) proposing standards for landslide mapping, susceptibility zonation and image processing		multiscale	all	other hazards	landslides	multiscope	all					High	QB - specific hazards and urban/territorial scale	Landslide, landslide modelling, recovery management, risk mitigation, inventory map	http://www.lampre-project.eu/	
CRCM_a_058		Preparedness and Resilience to address Urban Vulnerability	UNIVERSITY COLLEGE DUBLIN, NATIONAL UNIVERSITY OF IRELAND, DUBLIN		2016/01/01-2019/12/31	PRUV	reshape how humanitarian action and development aid is undertaken in urban areas to address the challenge posed by urban vulnerability	N.N.		none	1. To advance the state of the art by exploring the relationship between resilience and socio-economic issues across a range of societal institutions. 2. To advance the state of the art by addressing the theoretical and practical gaps in the protection of crisis-affected communities and vulnerable groups in urban settings in order to acquire new evidence-based knowledge to foster resilience. 3. To advance the state of the art by determining the contribution of existing legal frameworks at different levels of governance to urban resilience and how they can be improved. 4. To advance the state of the art by positioning urban resilience within the human security paradigm. 5. To advance the state of the art by modelling the effectiveness of public health preparedness interventions in urban settings for improving households, community, and local government resilience to humanitarian crises.		multiscale	all	multihazards	all	multiscope	all					medium	QB - specific hazards and urban/territorial scale	legal, social, cultural, political and public health perspectives	http://pruv.ucd.ie/	

CRCM_a_039		Damage risk assessment, economic impact and mitigation strategies for sustainable preservation of cultural heritage in the times of climate change	FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.	FP7-ENVIRONMENT	2009/11/01-2014/10/31	CLIMATE FOR CULTURE	couple completely new high resolution (10x10km) climate change evolution scenarios with whole building simulation models to identify the risks for specific regions	Johanna Leissner		simulation model	elaboration of a more reliable damage assessment by connecting the future climate data with whole building simulation models and new damage assessment functions		building		multihazards	all	economic						high	QA - specific hazards and building/district scale	Cultural heritage, climate change, artefacts, historic buildings, indoor environments	https://www.climateforculture.eu/	
CRCM_a_040		Prioritising and sustainably governing Cultural heritage and Landscapes in European coastal and maritime regions	AALBORG UNIVERSITET	H2020-EU.5.b.3.1.	2018/05/01-2021/04/30	PERICLES	sustainable governance of cultural heritage (CH) in European coastal and maritime regions through the development of a theoretically grounded, multi-actor participatory framework	N.N.		none/report	a) develop an in-depth, situated understanding of the CH of marine and coastal land/seascapes, including knowledge across local, spatial, environmental, social and economic aspects; b), develop practical tools, based on stakeholder involvement and participatory governance, for mapping, assessing and mitigating risks to CH and to enhance sustainable growth and increase employment by harnessing CH assets; c), provide policy advice to improve integration of CH in key marine and environmental policies and the implementation of associated EU directives; and d), develop effective knowledge exchange networks		multiscale	all	multihazards	all	economic						high	QB - specific hazards and urban/territorial scale	coastal land, seascapes	https://www.pericles-heritage.eu/	
CRCM_a_041		Population Alerting Living Emergencies, Resilience and Training	UNIVERSITY OF GREENWICH	FP7-SECURITY	2014/04/01-2016/03/31	POP-ALERT	prepare societies and populations to cope with crisis and disasters in a rapid, effective and efficient way by blending traditional Crisis Preparedness & First-Reaction strategies with the use of innovative contemporary tools	Liz Bacon		dashboard	An information framework, realised as an online dashboard, providing real-time information to the public relating to current disaster scenarios and proposed actions. The framework incorporates both traditional and new media, in an effort to ensure the broadest possible coverage		multiscale	all	multihazards	all	social						medium	QB - specific hazards and urban/territorial scale	Large-scale crises, preparedness, emergencies, crisis management	http://www.pop-alert.eu/	
CRCM_a_042		An Integrated next generation PREParedness programme for improving effective inter-organisational response capacity in complex environments of disasters and causes of crises	INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS	H2020-EU.3.7.5.	2017/09/01-2020/08/31	IN-PREP	develop shared response planning, share information in real time, coordinate the use of critical resources to ensure a timely response and to avoid waste and misspending	Angelos Amditis		handbook and training platform	establish and demonstrate a next generation programme by enabling a reference implementation of coordination operations (Handbook of Transboundary Preparedness and Response Operations that synthesises the lessons learnt, recommendations, check-lists from past incidents) and a training platform (Mixed Reality Preparedness Platform a novel IT-based tool, which holistically integrates Information Systems (IS) and Situational Awareness (SA) modules over a decision support mechanism and the visualisation of assets and personnel) to the entirety of civil protection stakeholders (firefighting units, medical emergency services, police forces, civil protection units, control command centres, assessment experts)		multiscale	all	multihazards	all	multiscope	all					medium	QB - specific hazards and urban/territorial scale	Transboundary Preparedness, Response Operations	https://www.in-prep.eu/	
CRCM_a_043		The role of water vapor in mid-latitude storm track dynamics	WEIZMANN INSTITUTE OF SCIENCE	FP7-PEOPLE	2012/04/01-2016/03/31	CRISTYF(2011)	investigate the mechanisms controlling the energy budget of storm tracks focusing on the role of water vapor	Gabi Bernstein		GCM	A hierarchy of models ranging from idealized dry and moist general circulation models (GCMs) to full comprehensive atmospheric GCMs will be used through systematic studies in order to isolate the mechanisms governing the dynamics		multiscale	all	storms		multiscope	all					medium	QB - specific hazards and urban/territorial scale	water vapor, storm, general circulation models	https://cordis.europa.eu/project/id/304200	
CRCM_a_044		Morphological Impacts and COastal Risks induced by Extreme storm events	UNIVERSITÀ DEGLI STUDI DI FERRARA	FP7-ENVIRONMENT	2008/06/01-2011/05/30	MICORI	probabilistic mapping of the morphological impact of marine storm-surge to the production of early warning and information systems to support long-term disaster reduction	Paolo Ciavola		Hub maps through an effective Web_GIS system	conception of Storm Impact Indicators (SIIs) with defined thresholds for the identification of major morphological changes and flooding associated risks		multiscale	all	storms		multiscope	all					medium	QB - specific hazards and urban/territorial scale	storm, Storm-Impact Indicators,	https://www.micore.eu/	
CRCM_a_045		Safeguarding Cultural Heritage through Technical and Organizational Resources Management	ENGINEERING - INGEGNERIA INFORMATICA SPA	H2020-EU.5.5.	2016/06/01-2019/05/31	STORM	set of novel predictive models and improved non-invasive and non-destructive methods of survey and diagnosis, for effective prediction of environmental changes and for revealing threats and conditions that could damage cultural heritage sites	Silvia Bor		cooperation platform for collaboratively collecting and enhancing knowledge, processes and methodologies for sustainable and effective safeguarding and management of European Cultural Heritage	integrated system featuring novel sensors (intra-fluorescent and wireless acoustic sensors), legacy systems, state of the art platforms (including LIDAR and UAVs), as well as crowdsourcing techniques will be implemented, offering applications and services over an open cloud infrastructure		multiscale	all	multihazards	all	multiscope	all					high	QA - specific hazards and urban/territorial scale	cultural heritage, climate change, cultural identity, archaeology, Natural hazards, LIDAR, UAV, preventive conservation, damage assessment, cloud-based platform	http://www.storm-project.eu/	
CRCM_a_046		Adaptive decision support system for stormwater pollution control	ECOLE NATIONALE DES PONTS ET CHAUSSEES	FP5-EESD	2002/12/01-2006/03/31	DAYWATER	adaptive decision support system (ADSS) for use by stakeholders involved in urban storm water management where decisions are made on many scales reflecting the spatial topology of urban catchments and the dynamic nature of urban development	N.N.		online catalogue	online tool provides a database with detailed information on 15 structural best management practices (BMP), such as infiltration systems, ponds, basins and permeable surfaces. It also gives useful guidelines and information on 5 non-structural BMPs including snow management and cleaning practices		multiscale	all	storms		multiscope	all					low	QB - specific hazards and urban/territorial scale	storm	https://cordis.europa.eu/project/id/EVK1-CT-2000-00111	
CRCM_a_047		Fronts and Atlantic Storm Track Experiment	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	FP4-ENV 2C	1996/12/01-1998/11/30	FASTEX	understanding of the structure, dynamics, formation and decay of the cloud systems constituent of the North-Atlantic storm track	N.N.		database	The Fastex Data Base is the most comprehensive dataset available to date on mid latitude cyclones and storms. It gathers the measurements, both in-situ and remote, collected during a two months field experiment, in January and February 1997. Its Major asset is its collection of more than 10,000 High Resolution vertical profiles that span the North-Atlantic storm track, including the usually little observed central area.		multiscale	all	storms		multiscope	all					medium	QB - specific hazards and urban/territorial scale	storm, mid-latitude cyclones	http://www.cnrm.meteo.fr/fastex/	

CRCM_e_048		Optimizing and Enhancing the Integrated Atlantic Ocean Observing System	HELMHOLTZ ZENTRUM FÜR OZEANFORSCHUNG KIEL	H2020-EU.3.5.	2015/04/01-2019/09/30	AtlantOS	Development of a sustainable, efficient, and fit-for-purpose Integrated Atlantic Ocean Observing System (IAOOS)	Martin Visbeck		Integrated Atlantic Ocean Observing System	AtlantOS will demonstrate the utility of integrating in-situ and Earth observing satellite based observations towards informing a wide range of sectors using the Copernicus Marine Monitoring Services and the European Marine Observation and Data Network and connect them with similar activities around the Atlantic. AtlantOS will support activities to share, integrate and standardise in-situ observations, reduce the cost by network optimisation and deployment of new technologies, and increase the competitiveness of European industries, and particularly of the small and medium enterprises of the marine sector.		multiscale	all	multihazards	storms, floods	multiscale	all					medium	G8 - specific hazards and urban/territorial scale	storm	https://www.atlantos-h2020.eu/	
CRCM_e_049		Regional Storm, wave and surge scenarios for the 2100 century	DANISH METEOROLOGICAL INSTITUTE	FP4-ENV 2C	1997/12/01-2000/11/30	none	Improved statistical description of changes and understanding of key physical mechanisms	N.N.		statistical model	use numerical models to study storms, surges and waves, in the European/Northeast Atlantic region under present climate conditions and in a climate influenced by increase CO2 concentrations		multiscale	all	storm		multiscale	all					medium	G8 - specific hazards and urban/territorial scale	storm	https://cordis.europa.eu/project/id/ENV4970498	
CRCM_e_050		EUROPEAN SEA LEVEL OBSERVING SYSTEM	Rijkswaterstaat	IC COST	1996/09/12-2000/09/11	EOSS	The main objective of the Action is twofold. Firstly, to coordinate the further implementation of geodetic (space) techniques for sea level monitoring and fixing of all tide gauge benchmarks along the European coastline; secondly, to arrange agreements of a European level for the long term assembly, storage and exchange of uniform sea level and related data.	N.N.		various	1. The main technological objectives are: -optimization of tide gauge networks, -implementation of geodetic fixing of all tide gauge benchmarks (subject to funds being made available by national and/or international agencies), -establishment of regional sea level monitoring network. 2. The main management/research objectives are: -data production for determination of detailed spatial pattern of sea level rise, -improvement of the tidal modelling capabilities, -data production for better understanding of climatological contribution to sea level rise, -improvement of flood warning capabilities by real time exchange of tide gauge data.		multiscale	all	multihazards	storms, floods	multiscale	all					medium	G8 - specific hazards and urban/territorial scale	sea level	https://cordis.europa.eu/project/id/40/40	
CRCM_e_051		Resilience-Increasing Strategies for Coasts - toolKIT	STICHTING DELTARES	FP7-ENVIRONMENT	2013/11/01-2017/04/30	DISC-KIT	develop methods, tools and management approaches to reduce risk and increase resilience to low-frequency, high-impact hydro-meteorological events in the coastal zone	Ap van Dongeren		various	1. A Coastal Risk Assessment Framework (CRAF). 2. A quantitative, high-resolution Early Warning and Decision Support System (EWS/DSS). 3. A web-based management guide offering innovative, cost-effective, ecosystem-based DRR measures. 4. A Coastal Risk Database of present and historic socio-economic and physical data.		multiscale	all	multihazards	storms, floods	multiscale	all					high	G8 - specific hazards and urban/territorial scale	hazards, resilience, environment, storm surge, flash flooding, coastal risk assessment, early warning system, decision support system, disaster risk reduction, stakeholder participation, scenarios, mitigation and preparedness measures, building trust and societal acceptance	https://www.risckit.eu/csk/home.html	
CRCM_e_052		Geospatial based Environment for Optimisation Systems Addressing Fire Emergencies	UNIVERSITY OF GREENWICH	H2020-EU.1.3.3.	2016/05/01-2020/04/30	GEO-SAFE	Developing the tools enabling to set up an integrated decision support system optimizing the resources during the response phase	Ed Galea		various	• Developing a dynamic risk cartography of a region with regard to the possibility of a wildfire. The task will involve data collection (satellite and remote sensors), risk analysis and development of a tool enabling to forecast fire extension (, and in particular to predict fire and risk evolution during the response phase • Designing and testing a resource allocation tool for the response phase using the dynamic risk cartography. One of the problems to consider will be the resource allocation for securing key places (schools, hospitals, ...) given time dependent constraints. Problems will be identified through connections with final users, and the proposed solutions will be tested on simulated data. • Developing analyses of relevant management processes as well as training tools in order to facilitate the implementation of such solutions to be completed		multiscale	all	wildfire		multiscale	all					high	G8 - specific hazards and urban/territorial scale	Wildfires, Climate , EU, Australia	https://geosafe.lessons-on-fire.eu/	
CRCM_e_053		Seasonal Prediction of Fire danger using Statistical and Dynamical models	BARCELONA SUPERCOMPUTING CENTER	H2020-EU.1.2.2.	2017/09/06-2019/11/04	SPFireSD	operational seasonal wildfire forecasting system for Europe	Etienne Tourigny		C3S Seasonal Predictions	The EC-Earth Fire seasonal prediction system, using fire models from the LPJ-Guess dynamic vegetation model coupled to the EC-Earth climate model, was developed in offline configuration known as the EC-Earth Land Surface Model.		multiscale	all	wildfire		multiscale	all					high	G8 - specific hazards and urban/territorial scale	Wildfires, Climate , EU, Indonesia, Amazonia	https://www.bsc.es/research-and-development/projects/spfiresd-seasonal-prediction-fire-danger-using-statistical-and	
CRCM_e_054		Management techniques for optimisation of suppression and minimisation of wildfire effects	ALGOSYSTEMS SA	FP3-ENV 1C	1994/05/01-1996/04/30	PROMETHEUS	define suitable forest fire presuppression planning and suppression strategies in order to optimize resource utilization and minimize fire effects	N.N.		GIS Knowledge Based System	PROMETHEUS aims to define the roles that dominate the influence of interrelated fire management issues. Experimental plots will be established in Greece and Italy for monitoring wildfire impact to the soil , vegetation and forest ecology. Impact of fire to the soil will be studied by setting experimental fires in Italy and collecting data from past wildfires in Greece. Field and laboratory work will be contained for the comprehension of post fire natural regeneration and definition of the parameters affecting the resilience of Mediterranean pine forests.		multiscale	all	wildfire		multiscale	all					high	G8 - specific hazards and urban/territorial scale	Greece, Italy, wildfire	https://cordis.europa.eu/project/id/EV5V0401	
CRCM_e_055		An innovative approach of Integrated Wildland Fire Management regulating the wildfire problem by the wise use of fire	INSTITUTO SUPERIOR DE AGRONOMIA	FP6-SUSTDEV	2006/03/01-2010/02/28	FIRE PARADOX	creation of the scientific and technological bases for new practices and policies under integrated wildland fire management and in the development of strategies for its implementation in Europe	N.N.		toolkit	development of a technological platform that will integrate the fire model, the temporal and spatial variability of fuels and weather, and the potential ecological and social-economical impacts		multiscale	all	wildfire		multiscale	all					high	G8 - specific hazards and urban/territorial scale	wildfire	https://www.fireparadox.org/	
CRCM_e_056		Digital Alarm Network and Tracking Equipment for forest fire detection	AD TELECOM SL	H2020-EU.3.5.	2018/02/01-2018/07/31	DANTE	Integrated low-cost solution for the early detection of wild fires	Luis Crespo Fernandez		early warning system	The DANTE system provides the georeferenced coordinates of the fire source and accurately tracks the fire's progress, guiding firefighting operations on a real-time navigator		multiscale	all	wildfire		multiscale	all					high	G8 - specific hazards and urban/territorial scale	wildfire, forest management, alarm, tracking	https://cordis.europa.eu/project/id/807440	

CRCM_a_057		Training the next generation of integrated fire management experts	WAGENINGEN UNIVERSITY	H2020-EU.1.3.1.	2019/10/01-2023/09/30	PyroLife	trains the new generation of interdisciplinary experts in holistic integrated fire management, through knowledge transfer between South and NW Europe and application of lessons learned in prevention of floods and other crisis	Catherine Stoof		integrated training program	unique integrated training program, crucially developed with industry, provides 15 ESRs the in-depth, interdisciplinary, integrated and transferable knowledge and skills required to compete their research and maximise future employability. Individual projects target risk quantification (fire danger, vulnerability, megafire behavior, environmental and economic impacts); risk reduction (fire resilient home, garden and landscape design, prevention and governance), and risk communication (stimulating stakeholder and community resilience and preparedness).		multiscale	all	wildfire		multiscale	all					high	GR - specific hazards and urban/territorial scale	wildfire	https://pyrolife.lessons-learned.eu/	
CRCM_a_058		Integrated Fire Management System	NURWAN TECHNOLOGIES SRL	H2020-EU.3.	2019/09/01-2020/02/28	FIDI	support fire management in three principal stages of the process – to prevent and reduce wildfires, organize the management of firefighting, and after-fire recovery	N.N.		software tool	use satellite information, in site auxiliary data and weather predictions to achieve reliable and on time fire forecasts		multiscale	all	wildfire		multiscale	all					high	GR - specific hazards and urban/territorial scale	wildfire	https://www.nurwan.com/	
CRCM_a_059		Models and decision Support tools for integrated POnest policy development under global change and associated Risk and Uncertainty	CONSORCI CENTRE DE CIÈNCIA I TECNOLOGIA FORESTAL DE CATALUNYA	H2020-EU.1.3.3.	2016/01/01-2020/01/31	SuFuRoc	focused on forestry and climate change interactions, including the development of adaptive forest management tools	Jordi Garcia-Gonzalo		various	development of tools that may be used by public administrators, forest owners and industry for advanced integration of adaptive strategies in forest management planning as well as in policy analysis in a context of global change		multiscale	all	multihazards	wildfire, droughts	multiscale	all					medium	GR - specific hazards and urban/territorial scale	wildfire, forest management	http://sufuroc.cttc.cat/	
CRCM_a_060		Combining Human Assessment and Reasoning Aids for Decision-Making in Environmental Emergencies	Alenia Un' Azienda Finmeccanica SpA	FP3-ESPRIT 3	1992/05/27-1995/05/26	CHARADE	defining a general system architecture of DSS, providing powerful facilities for situation assessment and intervention planning in environmental emergencies	N.N.		general system architecture of DSS	a very general man machine interface (MMI) subsystem, based on tools for modeling the user task structure and for dynamically organizing the dialogue between user and system; a general intervention subsystem, applying constraint reasoning tools for checking operational constraints on the use of resources and for analysing temporal relationships among elementary and composed actions; a situation assessment subsystem, based on models of the territory, of the evolution of the emergency, of the emergency management organization; it includes a generalized cartographic module, supporting selective presentation and map based interaction.		multiscale	all	wildfire		multiscale	all					medium	GR - specific hazards and urban/territorial scale	wildfire	https://cordis.europa.eu/project/id/6065	
CRCM_a_061		An innovative solution for Firefighting through remote controlled aircrafts	DRONE HOPPER SL	H2020-EU.3.2.4.	2017/02/01-2017/07/31	DroneHopper	remote-controlled aircraft that incorporates a container unit to hold liquids that can be used for firefighting, propelling nebulised liquid to be directed towards land	N.N.		remote-controlled aircraft	innovative technology for wildfire extinguishment thanks to a patented release mechanism that convert the water into small water drops (water mist) and mixes it with the air creating a cool air flow that suffocates the fire by removing the oxygen from the chemical combustion reaction.		multiscale	region, building	multihazards	wildfire, fire	multiscale	all					high	GR - specific hazards and urban/territorial scale	wildfire, fire, drone	https://drone-hopper.com/	
CRCM_a_062		Improving Resilience to Emergencies through Advanced Cyber Technologies	FUNDAZIONE LINCS – LEADING INNOVATION & KNOWLEDGE FOR SOCIETY	H2020-EU.3.7.	2016/06/01-2019/05/31	I-REACT	increase the resilience of European citizens and assets to natural disaster through advanced cyber technologies	N.N.		platform	integrates existing services, both local and European, into a platform that supports the entire emergency management cycle		multiscale	all	multihazards	all	multiscale	all					high	GR - specific hazards and urban/territorial scale	climate change, emergency management services, crowdsourcing	https://www.i-react.eu/	
CRCM_a_063		Technological and Methodological Solutions for Integrated Wide Area Situation Awareness and Survivor Localisation to Support Search and Rescue Teams	INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS	FP7-SECURITY	2015/01/01-2018/12/31	INACHUS	detection and localisation of trapped victims during urban search and rescue (USAR) operations	Evangelos Sdongos		robot	The INACHUS robot is a snake like robot prototype designed to aid rescue teams in finding and communicating with victims under a collapsed building. An operator can remotely control the robot and drive it under the rubble by entering very small openings. The robot detects human presence through a mounted radar sensor, an electronic nose (which also detects dangerous gases) and an infrared camera.		building		earthquakes		multiscale	all					medium	GA - specific hazards and building/district scale	search and rescue, remote operations, crisis management, disaster response, first responders, robotics, emergency communications, common operational picture, sensors, structural assessment, remote sensing	https://www.inachus.eu/	
CRCM_a_064		Driving Innovation in crisis management for European Resilience	ATOS SPAIN SA	FP7-SECURITY	2014/05/01-2020/06/30	DRIVER+	develop a pan-European Test-bed for Crisis Management capability development enabling practitioners to create a space in which stakeholders can collaborate in testing and evaluating new products, tools, processes or organisational solutions	Marja Ilgen		various	the test-bed and the Portfolio of Solutions		multiscale	all	multihazards	natural hazards, terrorism	multiscale	all					medium	GR - specific hazards and urban/territorial scale	crisis management, trial, portfolio of solutions, CMMB, capability development, citizens, resilience, test-bed, disaster, emergency services	https://www.driver-project.eu/	
CRCM_y_065		Enhancing decision support and management services in extreme weather climate events	ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKI S ANAPTYXIS	H2020-EU.3.7.	2017/01/01-2019/12/31	BeAWARE	developed a comprehensive comprehensive and analysis platform to help decision-makers, first responders and citizens	Fotnios Fotopoulos		various	includes multilingual verbal and written communication analyses, multilingual report generation and emergency multimedia-enriched communication		multiscale	all	multihazards	flood, fire, heatwave	multiscale	all					high	GR - specific hazards and urban/territorial scale	disaster, crisis, first responder, citizens, social media, emergency, crisis management, extreme weather, heatwave, local level	https://beaware-project.eu/	
CRCM_a_066		INTEGRATED AND ADAPTIVE RESPONSES TO TOXIC EMERGENCIES FOR RAPID TRIAGE ENGINEERING THE ROADMAP FROM CASUALTY TO PATIENT TO SURVIVOR	LOUGHBOROUGH UNIVERSITY	H2020-EU.3.7.	2015/09/01-2019/09/30	TOXI-triage	new platform for medical care and site management during triage of chemical, biological, radiological and nuclear (CBRN) crises will enhance information access and utilisation to enhance outcomes	C. L. Paul Thomas		single platform	TOXI-triage developed and integrated numerous technologies to address the operational, technological, ethical and societal dimensions of CBRN response and recovery, and to ensure a path to a sustainable CBRN and multiuse system. Tag and Trace technology integrated with traceable point-of-care diagnostic tests delivers casualty traceability. The tests detect exposure to many CBRN agents. In a pioneering world-first, metabolites of injury from exposure (volatile organic compounds) in breath, respiratory skin vapours and urine can be assessed with a single platform.		multiscale	all	other hazards	CBRN	multiscale	all					medium	GR - specific hazards and urban/territorial scale	CBRN, triage, medical, first responder, crisis, real time, civilians, social media, chemical, biological, radiological, nuclear	http://toxi-triage.eu/	

CRCM_a_067		Expecting the unexpected and know how to respond	SINTEF AS	H2020-EU.3.7.	2015/06/01-2018/09/30	DARWIN	development of European resilience management guidelines	Ivonne Herrera		guidelines	European resilience management guidelines will improve the ability of stakeholders to anticipate, monitor, respond, adapt, learn and evolve, to operate efficiently in the face of crises. Guidelines will be presented in formats for easy usage and maintenance to avoid them being dust-collectors on a shelf. To enable dynamic, user-friendly guidelines the project will adapt innovative tools (e.g. serious gaming, training packages), test and validate the guidelines, and establish knowledge about how organisations can implement guidelines to improve resilience.		multiscale	all	multihazards	all	multiscope	all					medium	GD - non-specific hazards and urban/territorial scale	resilience, crisis, guidelines	https://h2020darwin.eu/	
CRCM_a_068		DAnube river region Resilience Exchange network	BUNDESANSTALT FÜR DIE BINNEN	H2020-EU.3.7.6.	2017/09/01-2022/08/31	DAREnet	support flood management practitioners across the EU Danube River region and from different disciplines to deepen and broaden their Research, Development and Innovation-related collaboration (=RDI)	Christian J. Ring		RDI Roadmap	One of the key results of DAREnet will be a regularly updated RDI Roadmap highlighting promising innovation opportunities to cope with the main environmental and societal challenges of the region. It will provide concrete perspectives for the further development, industrialisation and uptake of innovations of highest relevance for practitioners. The Roadmap will be the result of a systematic assessment and prioritisation of promising innovations, including standardisation to foster the development of common capabilities. The RDI Roadmap will also lay the basis for concrete innovation initiatives, practitioner-driven and "bottom-up", building a unique portfolio of joint innovation concepts for the Danube river region.		multiscale	all	floods		multiscope	all					medium	GB - specific hazards and urban/territorial scale	flood, Danube	http://darenetproject.eu/	
CRCM_a_069		A Large-Scale Systems Approach to Flood Risk Assessment and Management	HELMHOLTZ ZENTRUM POTSDAM DEUTSCHES GEOFORSCHUNGS ZENTRUM GFZ	H2020-EU.1.3.1.	2018/01/01-2019/12/31	SYSTEM-RISK	develop a systems approach considering the complete flood risk chain, the manifold interactions, and temporal changes in flood risk systems, to train ECRs in state-of-the-art methodologies, and to give an integral view on flood risk systems	N.N.		training system	2 essential pillars of flood risk research: 1. Risk chain: considering the complete risk chain from the Sources through the Pathways to the Receptors and Consequences. 2. Interactions: augmenting the 'Source-Pathway-Receptors and Consequences' model by putting interactions centre stage and, in this way, replacing the traditional linear approach of the risk chain by a more realistic approach with interdependent linkages between physical and societal processes which finally shape the spatio-temporal flood risk. 3. Temporal dynamics: investigating the time-varying nature of flood risk and its components on different time scales so for instance hours to days when flood defence failures change flood probabilities, months to years when people learn from damaging floods and improve private precaution and decades to centuries when human settlements in floodplains evolve.		multiscale	all	floods		multiscope	all					high	GB - specific hazards and urban/territorial scale	flood	https://www.system-risk.eu/	
CRCM_a_070		Landslides, Floods and erosion: new insights from event-based field measurements in the Southern Alps of New-Zealand and stochastic 2D numerical modeling of long-term landscape evolution	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS	FP7-PEOPLE	2010/12/01-2013/02/28	NEROSNZ	predicting the catchment response to large earthquakes that could trigger extensive landslides in vulnerable regions of the world	N.N.		stochastic landslide module	combine innovative field measurements using Terrestrial Laser Scanner, documenting individual flood and landslide impacts on channel morphology in the extremely active Southern Alps of New-Zealand, and 2D stochastic numerical modeling of landscape evolution to explore the long-term consequences and improve on the hazard assessment of rare extreme events such as landslide dams		multiscale	all	multihazards	Flood, landslide	multiscope	all					high	GB - specific hazards and urban/territorial scale	flood, landslide	https://cordis.europa.eu/project/id/254871	
CRCM_a_071		Collaborative research on Flood resilience in urban areas	THE UNIVERSITY OF EXETER	FP7-ENVIRONMENT	2010/04/01-2014/04/30	CORFU	provide adequate measures for improved flood management in cities	Slobodan Djordjevic		flood resilience index assessment tool	a 2D model that simulates transport of pollutants and enables the assessment of health impacts of floods, a direct damage toolbox, a web-based system for analysis of flood and damage maps, and a flood resilience index assessment tool. Other models focus on quantifying a range of socioeconomic drivers and indicators in case study cities. These include an urban growth model and the awareness-relationships-livelihood framework, which assesses the ability to cope with floods.		multiscale	all	floods		multiscope	all					medium	GB - specific hazards and urban/territorial scale	Flood response, flooding, flood management, flood resilience, urban flooding	http://www.corfu7.eu/	
CRCM_a_072		Flood zoning in Southeast Attica using gauge calibrated radar rainfall and advanced modeling techniques	NATIONAL TECHNICAL UNIVERSITY OF ATHENS - NTUA	FP7-PEOPLE	2007/09/01-2011/03/31	FLADAR	produce flood risk zones in selected areas southeast of Athens, Greece	N.N.		various	use GIS and distributed modeling techniques supported by rain gauge calibrated radar rainfall from the polarimetric radar of the NOA and historical rainfall data from the METEONET gauge network operated by NTUA		multiscale	all	floods		multiscope	all					medium	GB - specific hazards and urban/territorial scale	flood	https://cordis.europa.eu/project/id/211108	
CRCM_a_073		IMProved multivariate frequency Analysis of Flood extremes by copulAs in a non-stationary environment	TECHNISCHE UNIVERSITÄT WIEN	FP7-PEOPLE	2013/02/01-2015/01/31	IMPALA	copula-based multivariate frequency modelling of flood extremes	N.N.		copula-based multivariate frequency model	- to study the dependence structure between the flood characteristics (flood and the respective volumes and durations; floods at river confluences), which often is non-linear, by means of copulas, and reduce the uncertainty in the choice and estimation of the fitted copula family, of the multivariate design values and their return periods, arising from the lack of the available data in the right tail of the joint distribution function of the variables, - to improve the frequency modelling of the marginal distributions of multivariate flood characteristics by improving the statistical background for the for inclusion of historical floods and reconstructed flood extremes from engaged basins into a regional flood frequency analysis, - to expand the spatial scope of the analysis, i.e. to evaluate the flood risk related to reconstructed flood events using different pan-European datasets of flood available through various European projects such as: FRIEND.		multiscale	all	floods		multiscope	all					medium	GB - specific hazards and urban/territorial scale	flood, multivariate, frequency analysis, flood extremes, flood peak, flood volume, copulas, bivariate distribution, Markov chain Monte Carlo, flood driving mechanisms, processes	https://cordis.europa.eu/project/id/301953	

CRCM_e_074		Integrated Flooding Control and Standard for Stability and Crisis Management	AALTO KORKEAKOULU SAATIO SR	FP7-TRANSPORT	2009/03/01-2012/02/29	FLOODSTAND	to increase the reliability of flooding simulation tools in design and onboard use by establishing modelling principles and uncertainty bounds	Risto Jalonen		risk-based standard	1. by establishing new experimental and computational data and guidelines for modelling leakage through closed doors and the critical pressure head for collapsing under the pressure of floodwater. 2. by simplified modelling of pressure losses (discharge coefficients) or flows through typical openings. 3. by feasible and realistic modelling of compartments with complex layout, such as cabin areas, for flooding simulation tools. 4. by the use of flooding monitoring systems and time domain simulation for assessing the damage and flooding extent onboard the damaged ship		multiscale	ship	floods		economic	all					low	QA - specific hazards and building/district scale	flood, ship safety	http://floodstand.aalto.fi/	
CRCM_e_075		A LIFE JACKET FOR YOUR HOUSE IN FLOOD TIMES	FLOODFRAME OÜ	H2020-EU.3.	2019/05/01-2019/09/31	FloodFrame	an automatic and pre-installed Flood Protection Technology for houses and buildings based on a waterproof membrane, which wraps the building during flood events protecting also its foundation	N.N.		physical barrier	activated by the rising water functioning without any electricity or human interaction while giving the possibility to increase the protection height during the flood automatically as high the water rises		building		floods		economic						medium	QA - specific hazards and building/district scale	flood, barrier	https://floodframe.com/	
CRCM_e_076		Market replication of a cutting-edge Flood Risk SciEtFring Tool	SCALGO DEVELOPMENT APS	H2020-EU.3.	2019/01/01-2019/05/31	FIReSEF	a disruptive online platform that harnesses the descriptive power of big geometric data sets to provide cost-effective and updated decision support for end-users working with flood risk and climate change adaptation	N.N.		scalable online decision support tool	enable a more systemic approach to flood risk management, leading to strategic decisions at various levels for a range of end users (the public sector, businesses, and individuals), and supporting EU mitigation and adaptation policies		multiscale	all	floods		multiscope	all					medium	QB - specific hazards and urban/territorial scale	flood	https://scalgo.com/en-US/live-flood-risk	
CRCM_e_077		Understanding long-term FLOOD pattern variability in Western Mediterranean using natural ARChives	UNIVERSITE GRENOBLE ALPES	H2020-EU.1.4.2.	2019/04/01-2021/03/31	FLOODARC	provide a more comprehensive understanding of the long-term variability of hazardous (high-impact) floods at different temporal and spatial scales	N.N.		high-impact flood database	State-of-the-art statistical tools applied to the flood database will allow the EB i) to evaluate, for the first time, the causes of non-stationarity in the long-term flood pattern evolution at a sub-continental scale and, ii) to investigate the role of the climate variability on the high-impact flood patterns at centennial to millennial time-scales in W Mediterranean		multiscale	all	floods		multiscope	all					high	QB - specific hazards and urban/territorial scale	flood	https://cordis.europa.eu/project/id/794752	
CRCM_e_078		Space-Time scaling of the Rainfall to FLOOD transformation	TECHNISCHE UNIVERSITAET WIEN	H2020-EU.1.3.2.	2018/08/01-2020/07/31	STARFLOOD	Reliable approaches for estimating flood probabilities in space and time are needed for optimizing flood risk management	Korbinian Breinl		space-time stochastic weather models	My project "Space-Time scaling of the Rainfall to FLOOD transformation" (STARFLOOD) responds to this research gap by investigating, for the first time, how the probabilities of rainfall transform into probabilities of floods from a space-time perspective, and how they can be simulated by space-time stochastic weather models at large spatial scales. STARFLOOD is highly innovative as it (i) explores the performance of the full cascade of rainfall to flood probabilities, (ii) explores the physical causes of flood probabilities and (iii) significantly improves the understanding of the scaling behaviour of hydrological processes.		multiscale	all	multihazards	rain, flood	multiscope	all					high	QB - specific hazards and urban/territorial scale	rain, flood	https://www.starflood.at/top	
CRCM_e_079		Technologies for the cost-effective Flood Protection of the Built Environment	STICHTING DELTARES	FP7-ENVIRONMENT	2009/11/01-2011/10/31	FLOODPROBE	provide cost-effective means for the flood protection and damage mitigation in urban areas	Dirk van Ilen		flood risk management strategy	FloodProBE will develop, test and disseminate technologies, methods, concepts and tools for risk assessment and mitigation, focussing particularly on the adaptation of new and existing buildings (retrofitting) and on infrastructure networks. The three main elements addressed by FloodProBE are (a) the vulnerability of critical infrastructure and high-density value assets, being the main originators of direct and indirect flood damage, (b) the reliability of urban flood-defences by improving understanding and assessment of failure processes that have proven to be critical in recent flood events and (c) construction technologies and concepts for flood-proofing buildings and infrastructure networks to increase the flood resilience of the urban system as well as for retrofit and repair of flood defences in the most economic and cost beneficial manner.		multiscale	all	floods		multiscope	all					high	QB - specific hazards and urban/territorial scale	floods, urban areas, coastal zones, flood protection, built environment	http://www.floodprobe.eu/	
CRCM_e_080		The European Flood Database	TERRANEA DG (HAFTUNGSBESCHRANKT) GMBH	H2020-EU.2.1.6.	2018/06/01-2018/11/30	FMNDD	accurate, current and historical flood spatial information for risk modelling to help (re-)insurance companies improve their existing risk assessment processes	N.N.		database	create, validate, update, organise, license, and provide access to geospatial flood disaster information based on Earth Observations, meteorological data, and social media for the insurance industry to enhance their risk modelling and reduce their expenses		multiscale	all	floods		economic						high	QB - specific hazards and urban/territorial scale	flood, insurance business	https://cordis.europa.eu/project/id/729401/reporting	
CRCM_e_081		Public FLOOD Emergency and Awareness SERVice	SIMILCO ROMANIA SA	H2020-EU.3.6.	2019/08/01-2019/07/31	FLOOD-serv	a pro-active and personalised citizen-centric public service application that will enhance the involvement of the citizen and will harness the collaborative power of ICT networks (networks of people, of knowledge, of services) to raise awareness on flood risks and to enable collective risk mitigation solutions and response actions	N.N.		public service application	1. The Emergency Management Console, is developed under this project incorporating data from the other components and outside the project to produce analyses, decision suggestions and simulations, and monitoring of actions; 2. The Territory Management System will analyse satellite and aerial images to produce automated detection of floods and flood impacts. Novel and intelligent algorithms are being developed for identifying flood related events from images from satellites or drones. 3. The Social Media Component will support authorities in identifying evolution of public opinion on social media, creating opinion graphs and maps and enabling them to formulate appropriate communication strategies and messages. 4. The Citizen Direct Feedback component –allows citizens to transmit messages related to floods to relevant public authorities. The novelty of this solution is that from a technical point of view it matches flood management back office processes, and		multiscale	all	floods		multiscope	all					high	QB - specific hazards and urban/territorial scale	flood, awareness	http://www.floodserv-project.eu/	

CRCM_a_082		Flood Risk Assessment and mitigation for Masonry Arch Bridges	IMPERIAL COLLEGE OF SCIENCE TECHNOLOGY AND MEDICINE	H2020-EU.1.3.2.	2015/10/01-2017/09/30	FRAMWB	develop novel modelling strategies for masonry arch bridges and a comprehensive framework for the flood risk evaluation for these heritage structures	Enrico Tubaldi		risk assessment framework	The development of such a risk assessment framework, which is the main objective of this research, requires a strong multi-disciplinary approach and will entail i) the advancement of computational tools for the response prediction of masonry bridges subjected to flood-induced actions and ii) the accurate propagation of uncertainties inherent in the loading, the problem parameters and the simulation models.		building		Floods		multiscale	all					high	GR - specific hazards and building/district scale	flood	https://cordis.europa.eu/project/id/657067	
CRCM_a_083		Deciphering River Flood Change	TECHNISCHE UNIVERSITAET WIEN	FP7-IDEAS-ERC	2012/04/01-2017/03/31	FLOODCHANGE	understand how changes in land use and climate translate into changes in river floods	Günter Blöschl		flood-change model	analysing the processes separately for different flood types such as flash floods, rain on snow floods and large scale synoptic floods, use data from catchments in transects across Europe to build a probabilistic flood-change model that explicitly describes the change mechanisms		multiscale	all	Floods		multiscale	all					high	GR - specific hazards and urban/territorial scale	flood	https://floodchange.hydro.tuwien.ac.at/home	
CRCM_a_084		ADVANCEMENT OF SATELLITE RAINFALL APPLICATIONS FOR HYDROLOGIC MODELING WITH EMPHASIS ON FLOOD MONITORING	MIDDLE EAST TECHNICAL UNIVERSITY	FP7-PEOPLE	2011/04/01-2014/03/31	FLOODSAT	advance the utility of satellite-based rainfall estimates for hydrologic modeling, specifically for flood monitoring	Koray K. Yilmaz		satellite-based precipitation (SBP) products	The main objectives include evaluation of the satellite-based precipitation (SBP) products over the Western Black Sea Region in Turkey using the rain gauge network (Figure 1), devising a bias-adjustment algorithm for the SBP products and implementation of a hydrologic model in a selected watershed. An improved methodology for calibration and evaluation of the hydrological model utilizing streamflow observations measured at the outlet and interior points will be devised.		multiscale	all	multihazards	rain, flood	multiscale	all					high	GR - specific hazards and urban/territorial scale	flood, rain, Black Sea region	http://users.metu.edu.tr/yilmaz/html/Flood.html	
CRCM_a_085		Development of a universal flood protection tool using the force of the water to protect against floods	ATEDNEA SOLUTIONS HUNGARY KFT	FP7-SME	2013/10/01-2014/01/31	INFLATER	develop an automatic and portable device as a flood protection tool	Daniel Varga		inflatable dam	a versatile and automatically self-inflating flood barrier that monitors flood conditions and its own status, which information it also transmits wirelessly		multiscale	all	Floods		multiscale	all					high	GR - specific hazards and urban/territorial scale	flood, flood protection tool, rivers, inflatable barrier, flood barrier	https://cordis.europa.eu/project/id/289122	
CRCM_a_086		Land protection by improvement of Dike construction	SÄCHSISCHE BAU GMBH	FP6-SME	2006/10/01-2009/03/31	PRODICON	develop a universal dike rehabilitation technology applicable to all types and states of dikes	N.N.		physical repair methods	by preparing a new material as well as a means by which this can be injected and incorporated into the dike structure. A major advantage of the new technique is that the material can be successfully applied to wetted and softened dikes using conventional excavator machinery with modular exchangeable equipment units		multiscale	all	Floods		multiscale	all					medium	GR - specific hazards and urban/territorial scale	flood, dikes	https://cordis.europa.eu/project/id/52847	
CRCM_a_087		Coordination of research financed in the European Union on Flood risk management	DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS	FP6-COORDINATION	2004/11/01-2009/10/31	CRUE	CRUE ERA-NET will introduce structure within this area of European research through an inter-comparison of the process of research programme formulation, implementation and management	Paul Samuels		coordination action	to develop strategic integration of research at the national funding and policy development levels within Europe to provide knowledge and understanding for the sustainable management of flooding risks at the river basin and coastal process cell scale		multiscale	all	Floods		multiscale	all					high	GR - specific hazards and urban/territorial scale	flood, coordination of research	http://www.floodsite.net/	
CRCM_a_088		Near real-time flood forecasting, warning and management system based on satellite radar images, hydrological and hydraulic models and in-situ data	NORUT INFORMATION TECHNOLOGY LTD	FP5-EESD	2003/02/01-2006/01/31	FLOODMAN	develop methods for near real-time monitoring of flood extent	N.N.		expert decision system	using space-borne SAR and optical data combined with in-site measurements, hydrological and hydraulic model data		multiscale	all	Floods		multiscale	all					high	GR - specific hazards and urban/territorial scale	flood, early warning system, Whole, Germany, Alessandria, Italy and Kemijoki Finland	https://cordis.europa.eu/project/id/EVG1-CT-2002-00085	
CRCM_a_089		Innovative application of satellite and radar technology to real-time flood forecasting systems	Societa Generale di Ingegneria	FP4-INNOVATION	n.a.	WAMM	develop a Water Management Model (WAMM) to integrate modelling tools with SAR facilities into a Decision Support System that will provide end users with the required information to decide on action in flood situations	N.N.		Water Management Model	Technology Supply: In this context SAR images were processed to produce flood and soil moisture mapping, new facilities were developed to improve model performance. A prototype test was carried out in the Lasse pilot basin, where concurrently SAR imagery with a flood event was already available. - Technology Assimilation: Focusing on the application of WAMM to two pilot sites: Tagliamento Catchment (IT) and Dendre Catchment (BE). This involved transfer and customisation in order to meet end users requirements. Technology installation and training was also be carried out. - Technology Diffusion: the project results were disseminated through activities, focusing on potential new end-users.		multiscale	all	Floods		multiscale	all					high	GR - specific hazards and urban/territorial scale	flood, SAR	https://cordis.europa.eu/project/id/IN20600I	
CRCM_a_090		Forecasting floods in urban areas downstream of steep catchment	University College Dublin	FP4-ENV 2C	1996/05/01-1998/10/31	TELFLOOD	develop and evaluate the components of a modelling system to forecast floods in rivers draining steep mountainous catchments into flat plains where they flood large urban areas	N.N.		modelling system	The proposed system will consist of a high-resolution limited area meteorological model together with a hydrological catchment model and an hydraulic channel network model. All of these models exist separately and are available to the proposers. However the refinement and integration of all of them into a flood forecasting system has not yet been done for steep mountainous catchments.		multiscale	all	Floods		multiscale	all					medium	GR - specific hazards and urban/territorial scale	flood, urban areas, steep catchments	https://cordis.europa.eu/project/id/ENV4980257	
CRCM_a_091		Hydrometeorological data resources and technologies for effective flash flood forecasting	UNIVERSITA DEGLI STUDI DI PADOVA	FP6-SUSTDEV	2006/09/01-2010/01/31	HYDRATE	improve the scientific basis of flash flood forecasting by extending the understanding of past flash flood events, advancing and harmonising a European-wide innovative flash flood observation strategy and developing a coherent set of technologies and tools for effective early warning systems	N.N.		a freely accessible European Flash Flood Database	objective to collect flash flood data by combining hydrometeorological monitoring and the acquisition of complementary information from post-event surveys. This will involve a network of existing hydrometeorological Observatories, all placed in high flash flood potential regions		multiscale	all	Floods		multiscale	all					medium	GR - specific hazards and urban/territorial scale	flood	https://cordis.europa.eu/project/id/57024	

CRCM_e_092		INTEGRATED FLOOD RISK ANALYSIS AND MANAGEMENT METHODOLOGIES	HR WALLINGFORD LTD	FP6-SUSTDEV	2004/03/01-2009/02/28	FLOODSITE	produce improved understanding of specific flood processes and mechanisms and methodologies for flood risk analysis and management ranging from the high level management of risk at under-basin, estuary and coastal process cell scale down to the detailed assessment in specific areas	N.N.		various	identify technologies and strategies for sustainable flood mitigation and defence, recognising the complex interaction between natural biophysical systems and socio-economic systems, to support spatial and policy planning in the context of global change and societal advance		multiscale	all	floods		multiscope	all					medium	QB - specific hazards and urban/territorial scale	flood	https://cordis.europa.eu/project/id/505420	
CRCM_e_093		Data Fusion for Flood Analysis and Decision Support	GEE ERCIM	FP5-IST	2000/01/01-2003/02/28	AMFAS	create a model of the scene and to perform flood simulation	N.N.		Support Decision System			multiscale	all	floods		multiscope	all					medium	QB - specific hazards and urban/territorial scale	flood	https://cordis.europa.eu/project/id/IST-1999-11675	
CRCM_e_094		RISK ASSESSMENT AND SUSTAINABLE PROTECTION OF CULTURAL HERITAGE IN CHANGING ENVIRONMENT	Institute of Atmospheric Sciences and Climate - National Research Council of Italy (ISAC-CNR)	Interreg CE	2017/01/07-2020/06/30	ProteCH2save	improvement of capacities of the public and private sectors to mitigate the impacts of climate change and natural hazards on cultural heritage sites, structures and artefacts	Alessandro Bonazza		ProteCH2save Web GIS Tool for Risk Mapping	deliver ICT solutions (web-based inventory and maps) and tools (decision support tool, best practices manual, handbook on transnational rescue procedures) for risk management and protection of cultural heritage in central Europe		multiscale	all	multihazards	all	multiscope	all					high	QB - specific hazards and urban/territorial scale	climate change, natural hazards, cultural heritage sites, capacity building, evacuation plan	https://www.interreg-central.eu/Content.Node/ProteCH2save.html	
CRCM_e_095		Cultural HEritagE: Risks and Securing activities	Fondazione Lombardia per l'Ambiente	Interreg AS	2018/06/01-2021/02/30	CHEERS	providing innovative approaches and tools to secure and salvage cultural assets affected by natural risks.	N.N.		various	building the knowledge base for identifying and valorising the cultural heritage stock at risk; defining reference conservation/securing approaches, techniques and training for Civil Protection Operators; developing new models of emergency planning to protect cultural heritage, built on shared pilot experience and transferable at transnational level; capitalizing innovation technologies for effective and more comprehensive DDR and climate change adaptation policies		multiscale	all	multihazards	all	multiscope	all					high	QB - specific hazards and urban/territorial scale	Alpine spaces, climate change, natural hazards, cultural heritage sites,	https://www.alpine-space.eu/projects/cheers/en/home	
UNEP_e_096		Climate Resilient Cities and Infrastructures	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO	H2020-EU.3.5.	2015/05/01-2018/10/31	RESIN URBAN ADAPTATION E-GUIDE	To support the entire process of developing and implementing an adaptation plan			e-Guide, online platform	The platform offers information, guidance and insight to help authorities develop adaptation strategies and plans, as well as direction on which of the RESIN tools to use and at what stage of the process		city		climate-related		multiscope	all		online access to e-Guide and creation of a profile	Preparedness, Prevention, Response, Recovery	updated by the provider	high	QD - non-specific hazards and urban/territorial scale	online platform; prevention; preparedness; long term adaptation; mitigation plans; long term planning; strategies;	https://resin-cities.eu/fileadmin/user_upload/Handbook/RESIN_D4_3_guide_EN10_W-www.pdf	
UNEP_e_097		Climate Resilient Cities and Infrastructures	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO	H2020-EU.3.5.	2015/05/01-2018/10/31	European Climate Risk Typology	to visualise, describe, compare and analyse climate risk in European cities and regions			interactive map, online portal	interactive map that provide a wide range of indicator data, covering different aspects of climate risk, to support climate change risk assessment and the development of adaptation and resilience strategies		city		climate-related		multiscope	all	Internet connection	free access	Adaptation, Preparedness, Prevention, Response, Recovery	updated by the provider	high	QD - non-specific hazards and urban/territorial scale	climate risk; networks; policies; strategies; assess climate risk; climate risk indicators; map;	https://resin-cities.eu/fileadmin/user_upload/Handbook/RESIN_D4_3_guide_EN10_W-www.pdf	
UNEP_e_098		Climate Resilient Cities and Infrastructures	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO	H2020-EU.3.5.	2015/05/01-2018/10/31	Adaptation Options Library	to identify and prioritise options, to develop adaptation approaches.			platform, database	The Adaptation Options Library is a searchable database of all kinds of adaptation measures, addressing climate risks including heat, pluvial, fluvial and coastal floods, and drought		city		climate-related		multiscope	all	Internet connection	free access	Adaptation, Preparedness, Prevention	updated by the provider	high	QD - non-specific hazards and urban/territorial scale	library; adaptation measures; database; adaptation approaches; literature reference; solution;	https://resin-cities.eu/fileadmin/user_upload/Handbook/RESIN_D4_3_guide_EN10_W-www.pdf	
UNEP_e_099		Reconciling Adaptation, Mitigation and Sustainable Development for Cities	POTSDAM INSTITUT FÜR KLIMAFOLGENFORSCHUNG	FP7-ENVIRONMENT	2012/10/01-2017/09/30	Toolbox and Transition Handbook	support stakeholders and managers to make adaptation and mitigation decisions and prioritise investment			website, audioguide, slideback	This Toolbox comprises a Transition Handbook (a step-by-step guide), training materials, and a web-based audio-visual guidance application called on-urban-resilience.eu which synthesise project results in an accessible way for implementation by city stakeholders.		city		climate-related		multiscope	all		free access	Adaptation, Preparedness, Prevention	n.a	high	QD - non-specific hazards and urban/territorial scale	toolbox; strategies; adaptation measures; long term planning;	https://resin-cities.eu/home/	

10.4 Annex IV – Reference numbers and progressive codes for the regulatory framework, good practices and tools data gathering sheets

No. of reference in section 5	Progressive Code Annex I
[7]	UNESCO_b_141
[8]	UNESCO_b_001
[9]	UNESCO_b_002
[10]	UNESCO_b_003
[11]	UNESCO_b_007
[12]	UNESCO_b_008
[13]	UNESCO_b_009
[14]	UNESCO_b_010
[15]	UNESCO_b_011
[16]	UNESCO_b_012
[17]	UNESCO_b_013
[18]	UNESCO_b_006
[19]	collective documents
[20]	UNESCO_b_014
[21]	collective documents (including UNESCO_b_016, UNESCO_b_017, UNESCO_b_018, UNESCO_b_019)
[22]	UNESCO_b_015
[23]	UNESCO_b_020
[24]	UNESCO_b_021
[25]	UNESCO_b_022
[26]	UNESCO_b_023
[27]	UNESCO_b_024
[28]	UNESCO_b_025
[29]	UNESCO_b_026
[30]	UNESCO_b_027
[31]	UNESCO_b_028
[32]	UNESCO_b_029
[33]	UNESCO_b_030
[34]	UNESCO_b_031
[35]	UNESCO_b_032
[36]	UNESCO_b_033
[37]	UNESCO_b_034
[38]	UNESCO_b_035
[39]	UNESCO_b_036
[40]	UNESCO_b_037
[41]	UNESCO_b_038
[42]	UNESCO_b_039
[43]	UNESCO_b_040
[44]	UNESCO_b_041
[45]	UNESCO_b_042

[46]	UNESCO_b_043
[47]	UNESCO_b_044
[48]	UNESCO_b_045
[49]	UNESCO_b_046
[50]	UNESCO_b_047
[51]	UNESCO_b_048
[52]	UNESCO_b_049
[53]	UNESCO_b_050
[54]	UNESCO_b_051
[55]	Collection of documents (UNESCO_b_134 UNESCO_b_135 UNESCO_b_136 UNESCO_b_137 UNESCO_b_138)
[56]	UNESCO_b_005
[57]	UNESCO_b_052
[58]	UNESCO_b_053
[59]	UNESCO_b_054
[60]	UNESCO_b_055
[61]	UNESCO_b_056
[62]	UNESCO_b_057
[63]	UNESCO_b_058
[64]	UNESCO_b_059
[65]	UNESCO_b_060
[66]	UNESCO_b_061

[67]	UNESCO_b_062
[69]	UNESCO_b_063
[70]	UNESCO_b_064
[71]	UNESCO_b_065 and UNESC_b_066
[72]	UNESCO_b_067
[73]	UNESCO_b_068
[74]	UNESCO_b_069
[75]	UNESCO_b_070
[76]	UNESCO_b_071
[77]	UNESCO_b_075
[78]	UNESCO_b_073
[79]	UNESCO_b_074
[80]	UNESCO_b_076
[81]	UNESCO_b_077
[82]	UNESCO_b_090
[83]	UNESCO_b_091
[84]	UNESCO_b_092
[85]	UNESCO_b_093
[86]	UNESCO_b_094
[87]	UNESCO_b_096
[88]	UNESCO_b_095
[89]	UNESCO_b_116
[90]	UNESCO_b_117

[91]	UNESCO_b_118
[92]	UNESCO_b_119
[93]	UNESCO_b_120
[94]	UNESCO_b_121
[95]	UNESCO_b_122
[96]	UNESCO_b_123
[97]	UNESCO_b_129
[98]	UNESCO_b_105
[99]	UNESCO_b_125
[100]	UNESCO_b_126
[101]	UNESCO_b_127
[102]	UNESCO_b_128
[103]	UNESCO_b_132
[104]	UNESCO_b_155
[105]	UNESCO_b_142
[106]	UNESCO_b_143
[107]	UNESCO_b_144
[108]	UNESCO_b_146
[109]	UNESCO_b_147
[110]	UNESCO_b_149
[111]	UNESCO_b_150
[112]	UNESCO_b_145
[113]	UNESCO_b_148

No. of reference in section 6	**Progressive Code Annex II and III**
[4]	UNIBO_d_041
[5]	UNIBO_d_061
[6]	UNIBO_d_014
[7]	UNIBO_d_047
[8]	UNIBO_d_057
[9]	UNIBO_d_039
[10]	UNIBO_d_062
[11]	UNIBO_d_035 UNIBO_d_036 UNIBO_d_038
[12]	UNIBO_d_058
[13]	UNIBO_d_021
[14]	UNIBO_d_001
[15]	UNIBO_d_014
[16]	UNIBO_d_016 UNIBO_d_018 UNIBO_d_019 UNIBO_d_020
[17]	CRCM_e_030
[18]	CRCM_e_035
[19]	CRCM_e_044
[20]	CRCM_e_045
[21]	CRCM_e_031
[22]	CRCM_e_058
[23]	CRCM_e_039
[24]	CRCM_e_025
[25]	CRCM_e_018
[26]	
[27]	CRCM_e_021
[28]	CRCM_e_026
[29]	CRCM_e_032
[30]	CRCM_e_033
[31]	UNIBO_e_096 UNIBO_e_097 UNIBO_e_098
[32]	CRCM_e_062
[33]	UNIBO_d_099

[34]	UNIBO_d_100

10.5 Annex V – Next practices: Cultural Heritage attribute database for Sava River Basin Open Lab

In the schemas hereby presented the different partners contributions are differentiated through different colours, as follow:

ISRBC contribution, **UNIBO** contribution, **SISTEMA** contribution, **UNESCO** contribution

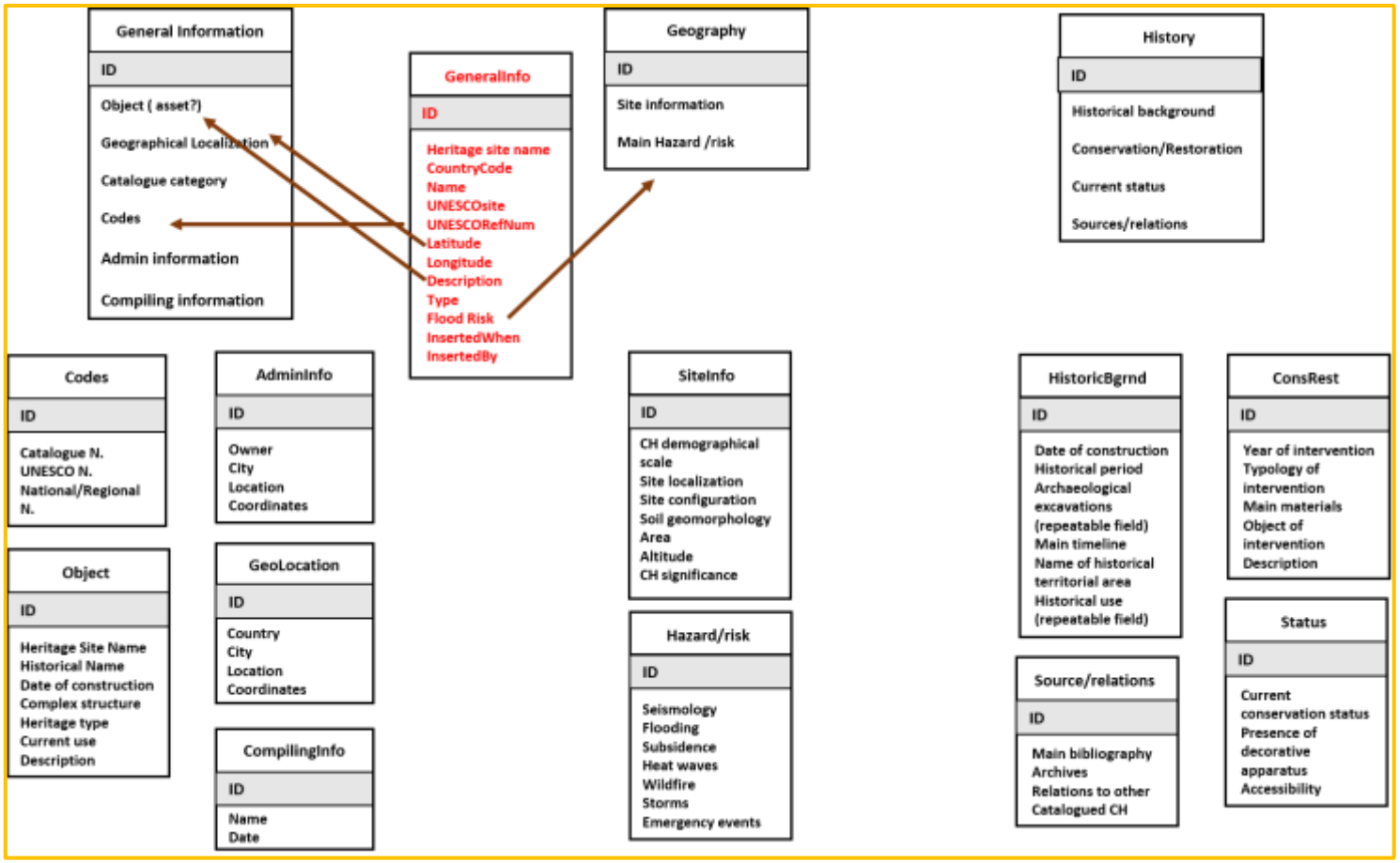

Figure A- 1: CH assets database mock-up – UNIBO proposal mapped onto SAVA requirement

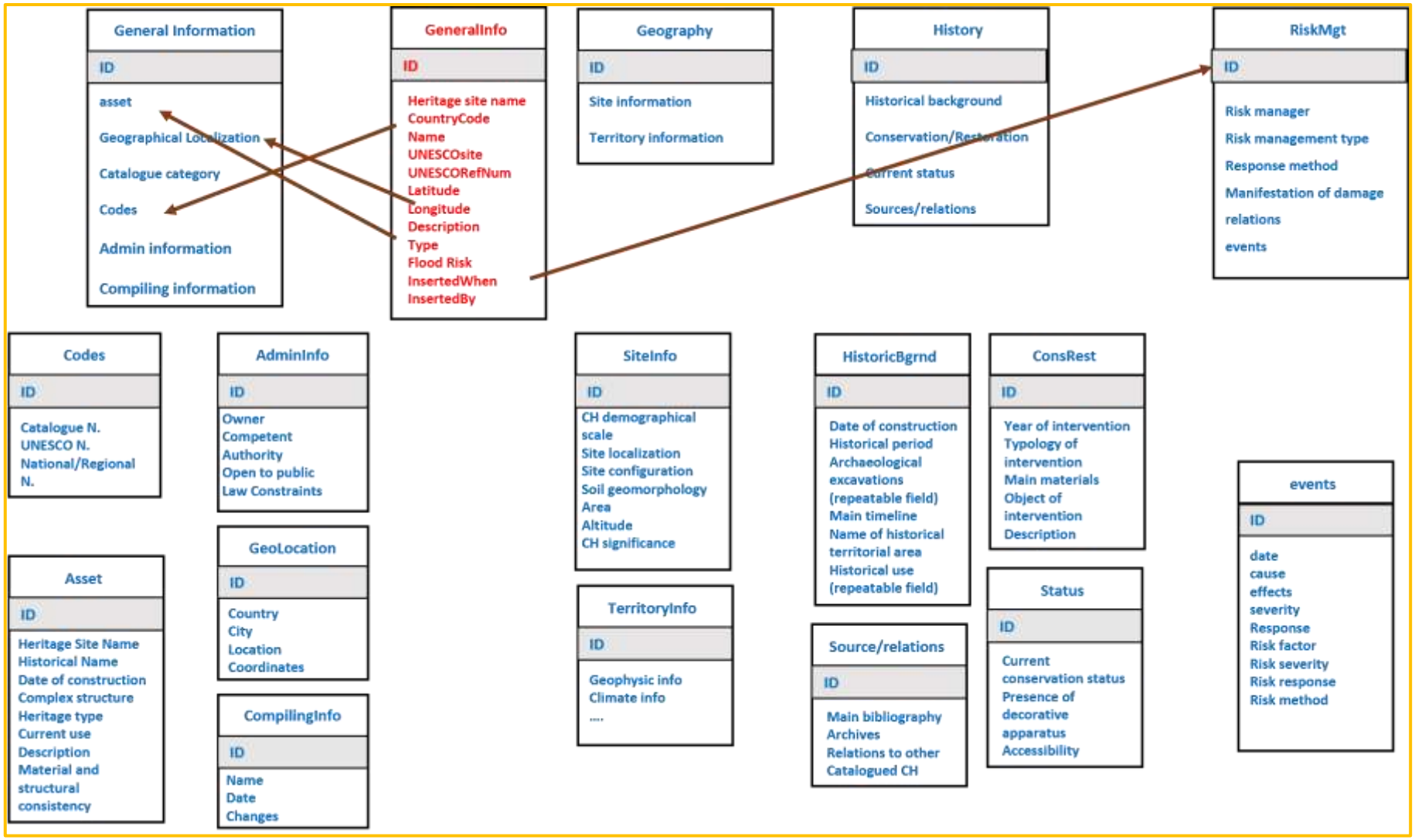
General Information
ID
asset
Geographical Localization
Catalogue category
Codes
Admin information
Compiling information
GeneralInfo
ID
Heritage site name
CountryCode
Name
UNESCOsite
UNESCORefNum
Latitude
Longitude
Description
Type
Flood Risk
InsertedWhen
InsertedBy
Geography
ID
Site information
Territory information
History
ID
Historical background
Conservation/Restoration
Current status
Sources/relations
RiskMgt
ID
Risk manager
Risk management type
Response method
Manifestation of damage
relations
events
Codes
ID
Catalogue N.
UNESCO N.
National/Regional N.
AdminInfo
ID
Owner
Competent Authority
Open to public
Law Constraints
SiteInfo
ID
CH demographical scale
Site localization
Site configuration
Soil geomorphology
Area
Altitude
CH significance
HistoricBgrnd
ID
Date of construction
Historical period
Archaeological excavations (repeatable field)
Main timeline
Name of historical territorial area
Historical use (repeatable field)
ConsRest
ID
Year of intervention
Typology of intervention
Main materials
Object of intervention
Description
events
ID
date
cause
effects
severity
Response
Risk factor
Risk severity
Risk response
Risk method
Asset
ID
Heritage Site Name
Historical Name
Date of construction
Complex structure
Heritage type
Current use
Description
Material and structural consistency
GeoLocation
ID
Country
City
Location
Coordinates
TerritoryInfo
ID
Geophysic info
Climate info
....
Source/relations
ID
Main bibliography
Archives
Relations to other Catalogued CH
Status
ID
Current conservation status
Presence of decorative apparatus
Accessibility
CompilingInfo
ID
Name
Date
Changes

Figure A- 2: CH assets database mock-up – WP1 proposal mapped onto ISRBC requirements

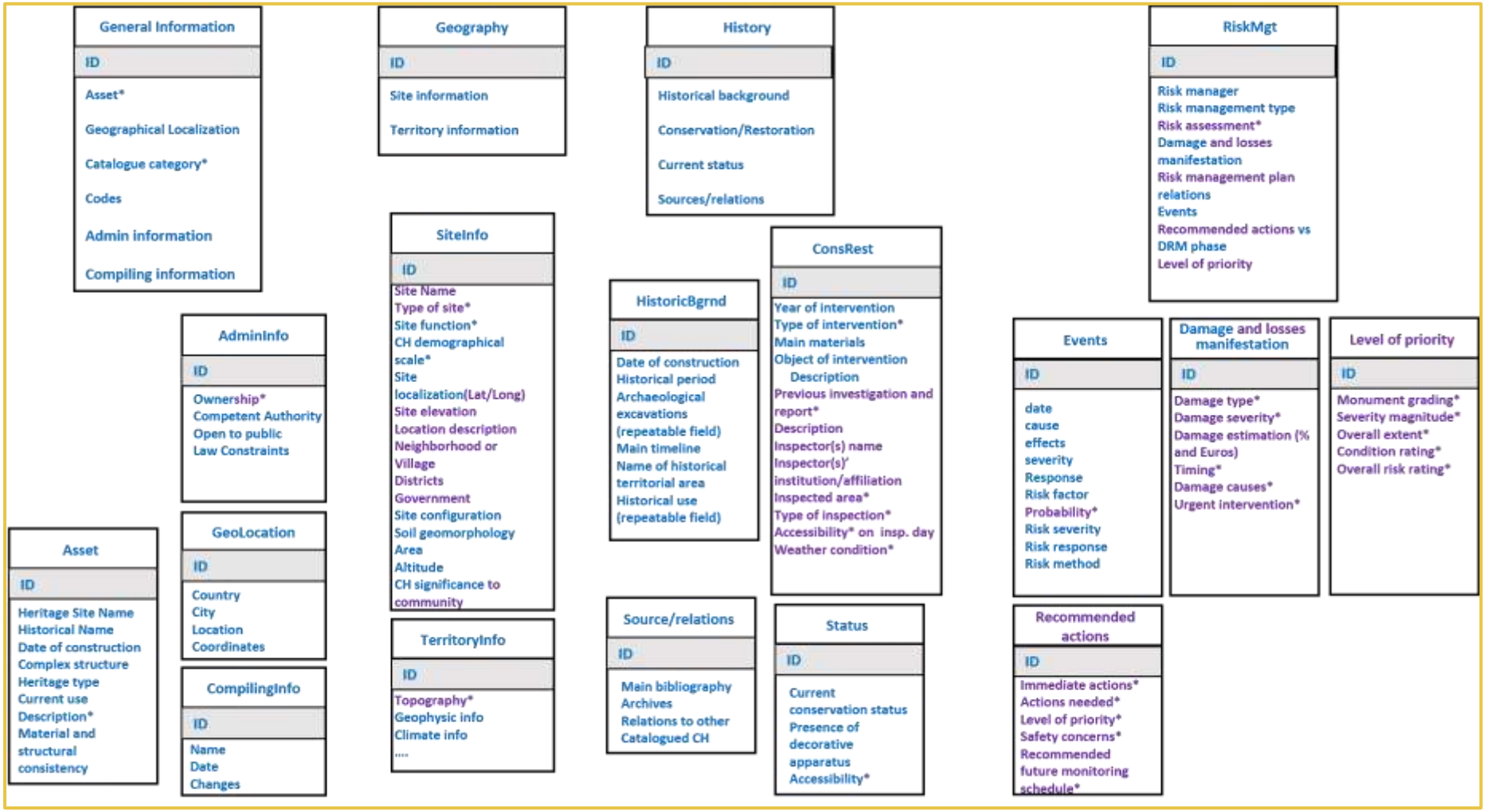

Figure A- 3: CH assets database mock-up (version 1.0) – integration of UNESCO contribution

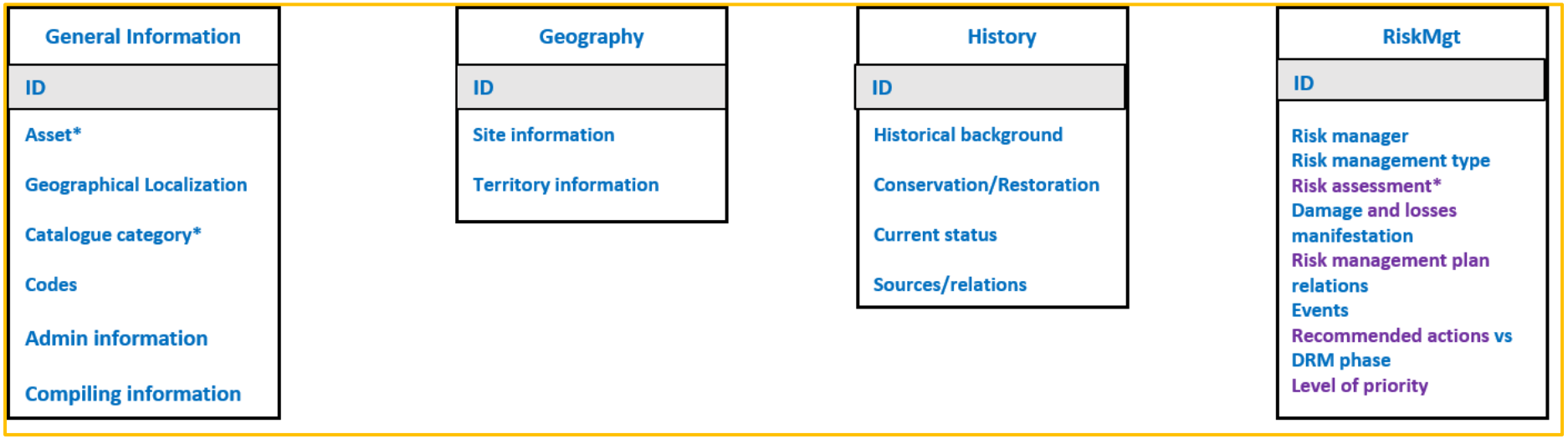

Figure A- 4: CH assets database mock-up (version 1.0) – Root tables

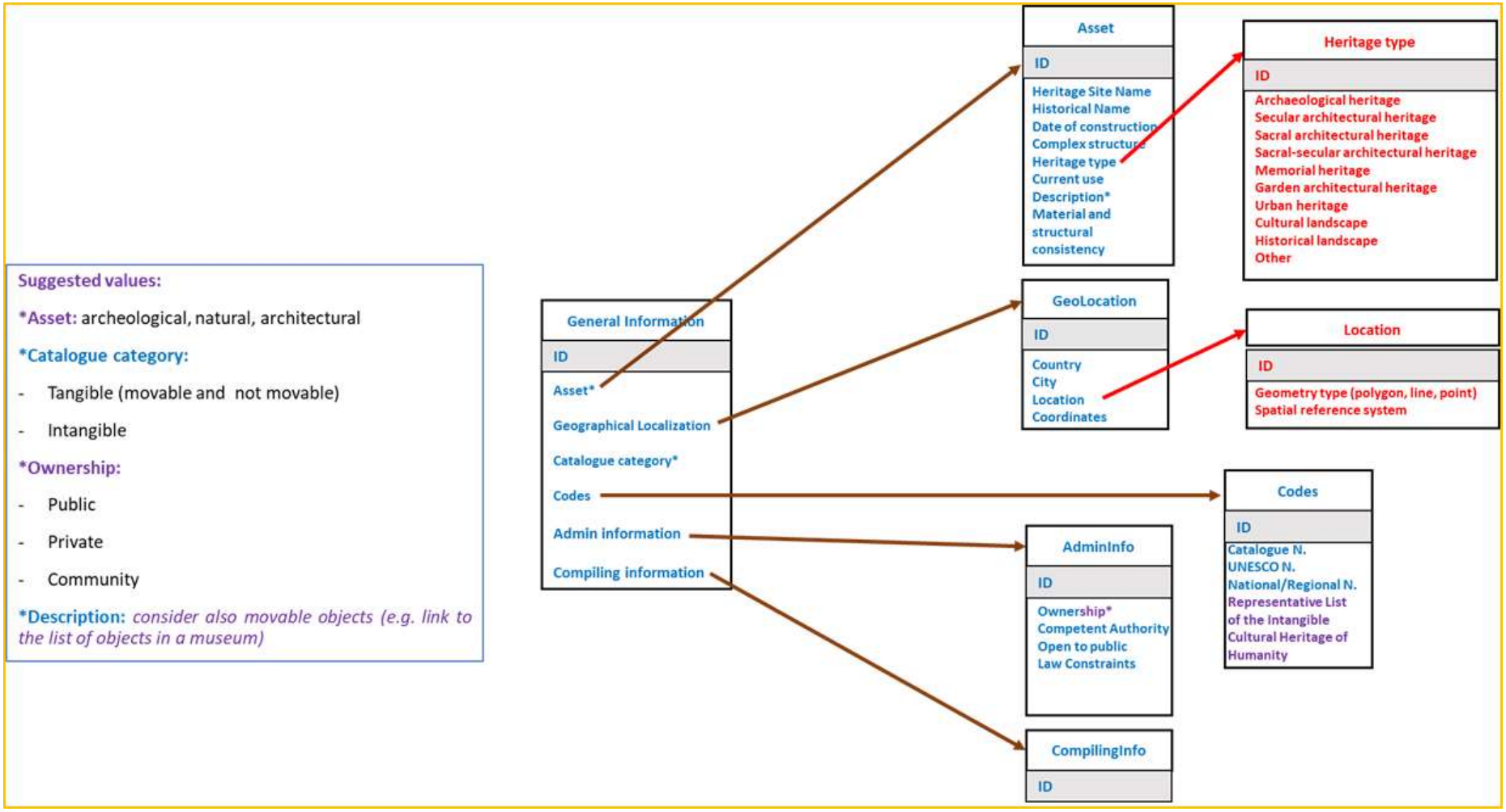

Figure A- 5: CH assets database mock-up (version 1.1) – General information tables and the related suggested tables

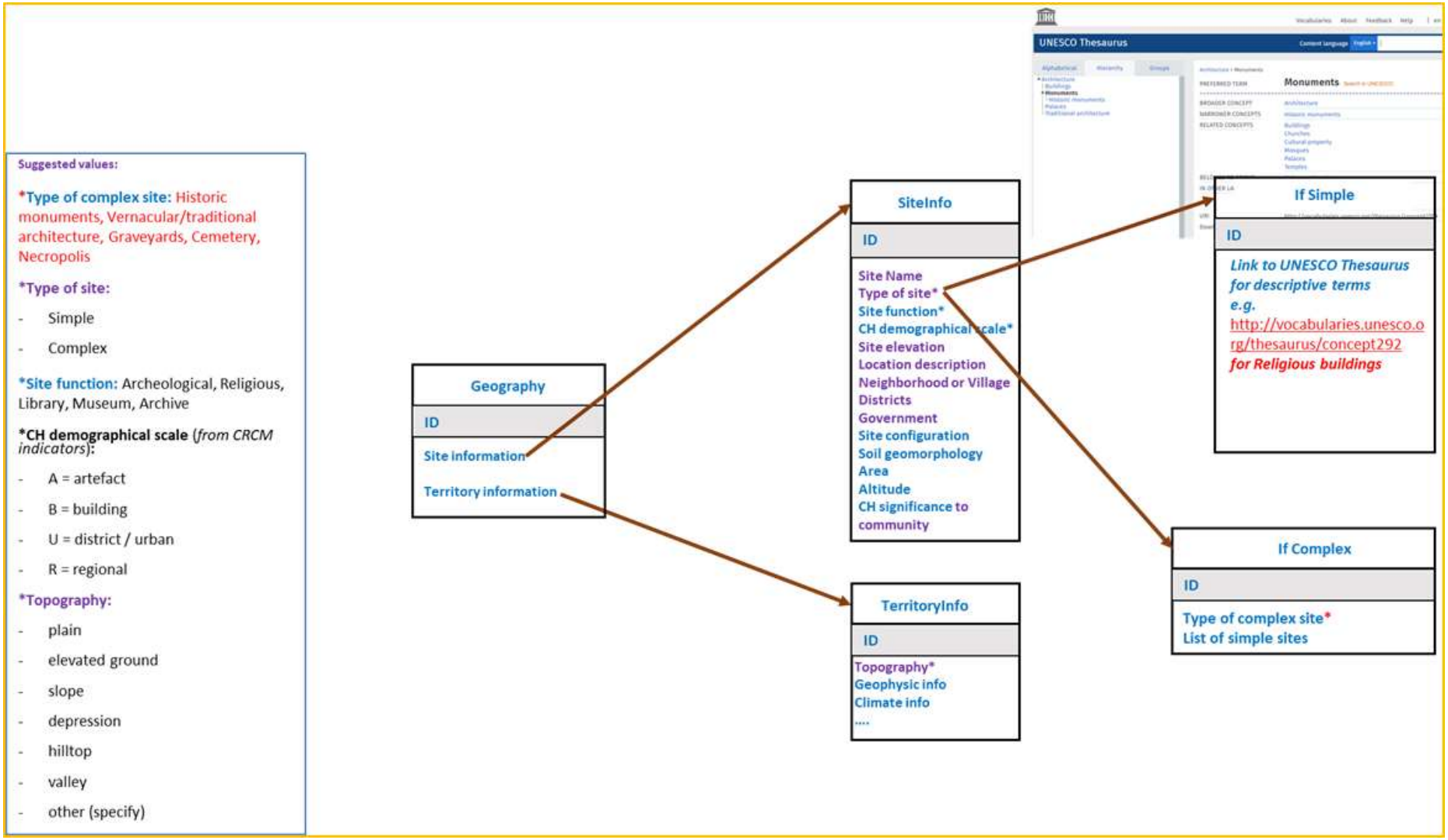

Figure A- 6: CH assets database mock-up (version 1.1) – Geography tables and the related suggested values

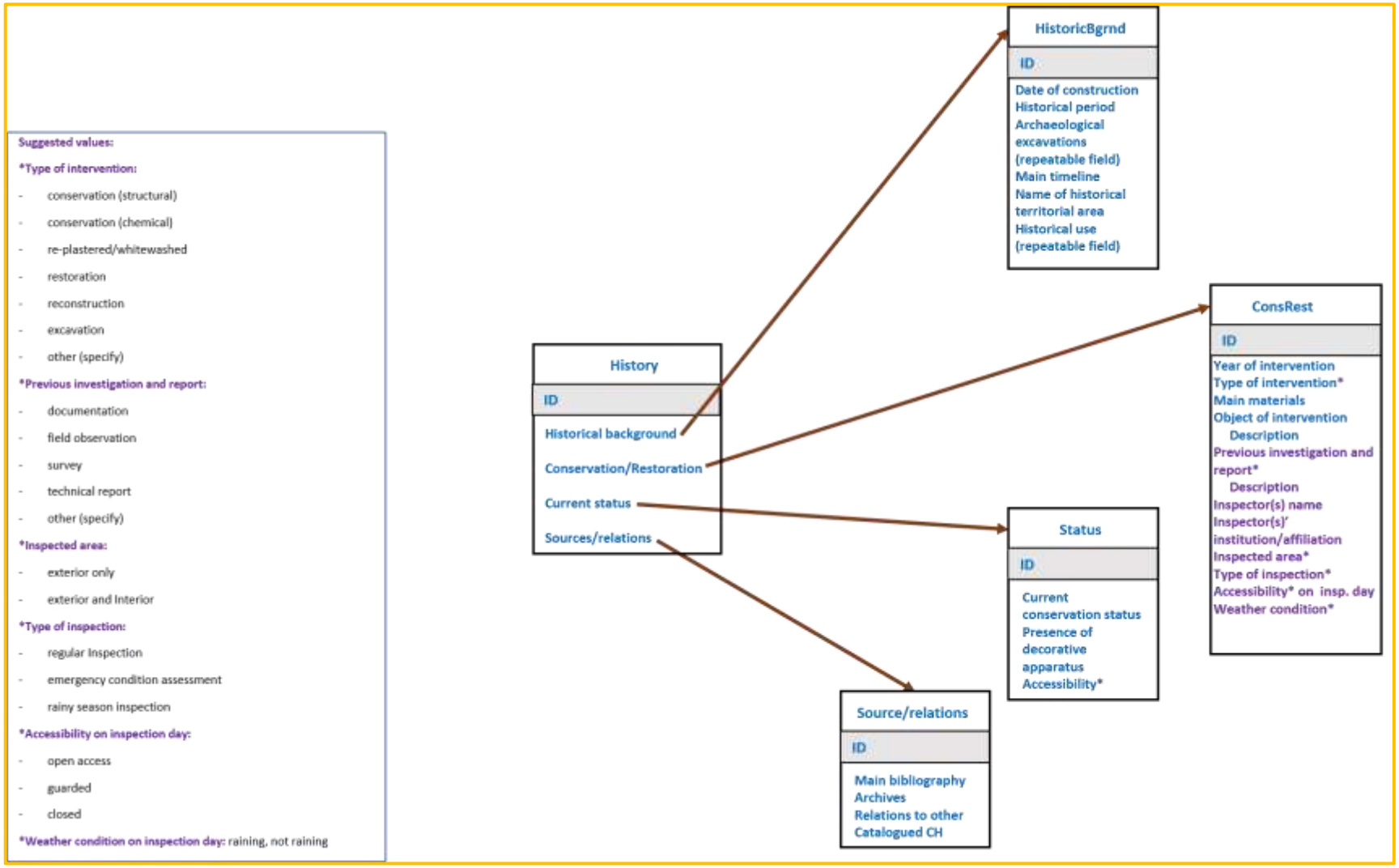
Suggested values:
*Type of intervention:
- conservation (structural)
- conservation (chemical)
- re-plastered/whitewashed
- restoration
- reconstruction
- excavation
- other (specify)
*Previous investigation and report:
- documentation
- field observation
- survey
- technical report
- other (specify)
*Inspected area:
- exterior only
- exterior and Interior
*Type of inspection:
- regular Inspection
- emergency condition assessment
- rainy season inspection
*Accessibility on inspection day:
- open access
- guarded
- closed
*Weather condition on inspection day: raining, not raining
History
ID
Historical background
Conservation/Restoration
Current status
Sources/relations
HistoricBgrnd
ID
Date of construction
Historical period
Archaeological excavations (repeatable field)
Main timeline
Name of historical territorial area
Historical use (repeatable field)
ConsRest
ID
Year of intervention
Type of intervention*
Main materials
Object of intervention
Description
Previous investigation and report*
Description
Inspector(s) name
Inspector(s)' institution/affiliation
Inspected area*
Type of inspection*
Accessibility* on insp. day
Weather condition*
Status
ID
Current conservation status
Presence of decorative apparatus
Accessibility*
Source/relations
ID
Main bibliography
Archives
Relations to other Catalogued CH

Figure A- 7: CH assets database mock-up (version 1.0 and 1.1) – History tables and the related suggested values

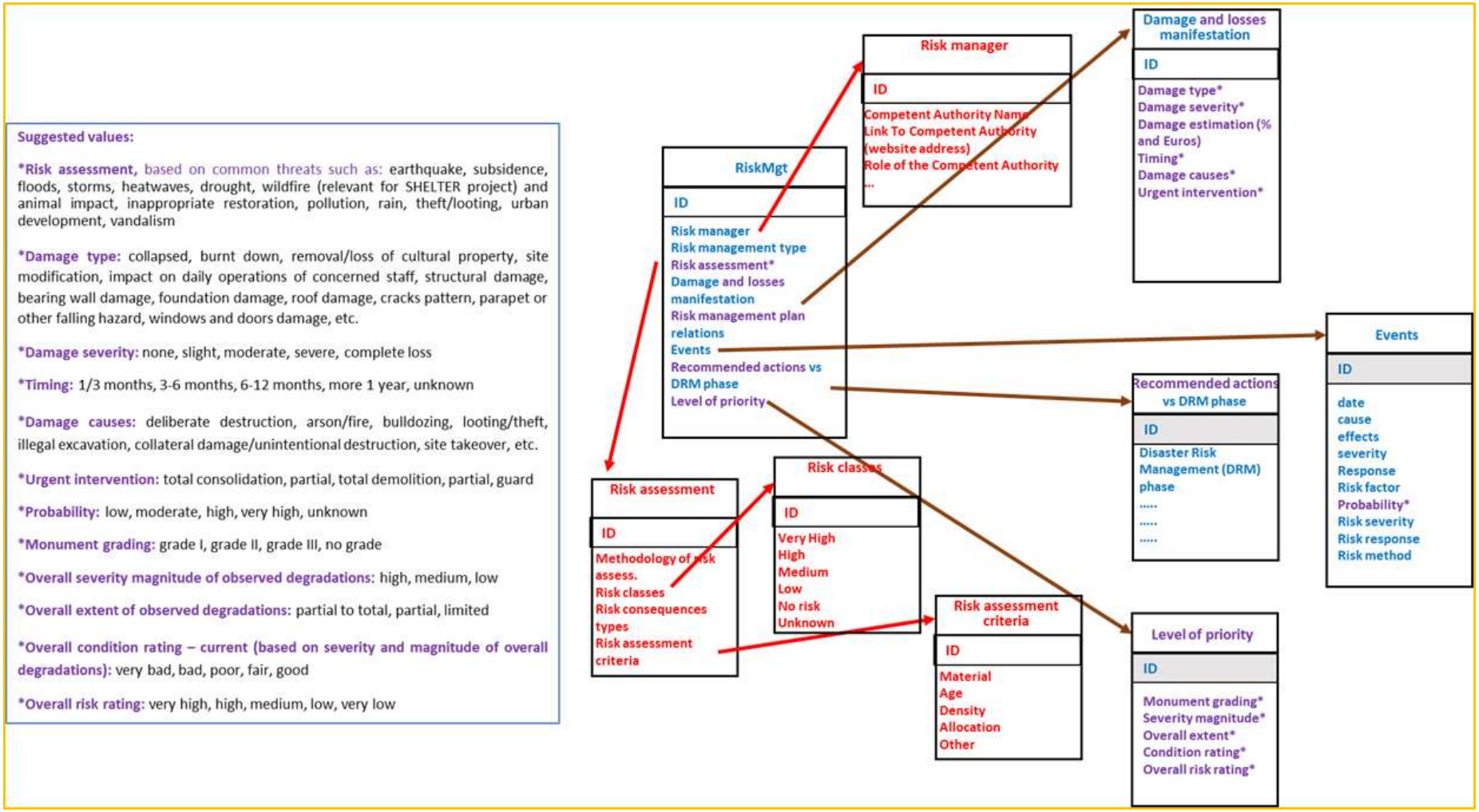

Figure A- 8: CH assets database mock-up (version 1.1) – Disaster Risk Management tables and the related suggested values

10.6 Annex VI – Protocol for historical events

Complete Protocol for the Ravenna Open Lab available here.

		EVENT GENERAL INFO								CLASSIFICATION OF DISASTER #1								SEVERITY			DAMAGE ON POPULATION									ECONOMIC DAMAGE			DAMAGE ON PHYSICAL ENVIRONMENT						GENERAL FIELDS					
PROGRESSIVE CODE	Case study Country (IT, ES, TK, NL, HR)	Name of Disaster	Date of Event	Area	event scale*	"multiscale", please specify which ones among those mentioned beside	damage scope*	"multiscope", please specify which ones among those mentioned beside	Brief Description of the event	Disaster type #1	Disaster Subgroup #1	Disaster Main Type #1	Disaster Main Type for Secondary Disaster #1	correspondence with SHELTER hazards*	"multihazard", please specify which ones among those mentioned beside. "other hazards", please add the description of the other hazards addressed.	climate/antropho. conditions as causes for the disaster /or VULNERABILITY	GLIDE number	Severity of the event* #2	Disaster Scale (e.g. earthquake: richter; wildfire: km2; Storm: kph Extremeatemp: celcius)	Magnitude (numeric, if possible)	death toll (no.)	Injured (no.)	Relocated/Evacuated (no.)	Missing (no.)	Homeless (no.)	Affected (no.)	Indirectly Affected (no.)	Total Affected (no.)	Overall Loss (€)	Insured Loss (€)	Damaged Businesses (€)	Buildings Destroyed	Buildings Damaged	Damages in Roads	Damages in public services (e.g. schools, hospitals, etc.)	Damages in agriculture (e.g. agricultural products, fields, etc.)	Damages in animal farming (i.e. cattle)	relevance to SHELTER*	quadrant*	keywords	references (newspapers, journals, catalogue)	references (links)	comments
POLITO_c_001	IT		2012-05-20	The region of Emilia Romagna in northern Italy with an epicentre approximately 30km west of Ferrara.	cross-regional		multiscope	economic, social, cultural	The quake struck at 4:04 am between Modena and Mantua, about 35 kilometres north-northwest of Bologna at a relatively shallow depth of five kilometres.	natural	Geophysical Event	Earthquake		earthquakes		FO.2012-000080-ITA		severe	Richter	5.9		7				7000			7000											High	QB - specific hazards and urban/territorial scale		EMDAT, GLIDE	https://www.uel.ac.uk/~uesstor/research-earthquake-EMDaring_Report_EM-FO.20012-v0.pdf	A magnitude 5.9 earthquake struck northeastern Italy on Sunday 20th May, early in the morning, killing at least seven people, injuring 50 and toppling several buildings. The quake struck at 4:04 am between Modena and Mantua, about 35 kilometres north-northwest of Bologna at a relatively shallow depth of five kilometres. The epicentre was between the towns of Finale Emilia, San Felice sul Panaro and Sermide, but was felt as far away as Tuscany and northern Alto Adige.
POLITO_c_002	IT	NA	2019-01-19	the epicentre is 11km far from Ravenna	city		multiscope	social; economic	The earthquake was located by: Bollettino Sismico Italiano INGV.	natural	Geophysical Event	Earthquake		earthquakes			NA	severe	Richter	4.6																	High	QB - specific hazards and urban/territorial scale		Istituto Nazionale di Geofisica e Vulcanologia (INGV)	http://cnt.rm.ingv.it/eq/event/21171241 https://www.raiplaysound.it/audiovideo/2019/01/Ho-terminato-magnitudo-big-4_1_a_4_d_6_onda_big_sismica_2019080757	* convocato il centro operativo comunale. Il comune ha poi fatto sapere che sono stati segnalati danni di lieve entità, e che le scuole resteranno chiuse oggi in via precauzionale. Il Comune di Cervia ha disposto, in via cautelativa, sopralluoghi in tutte le scuole comunali. * Repubblica A magnitude ML 3.0 earthquake occured in region: 9 km E Ravenna (RA), on 14-01-2019 23:29:07 (UTC) 10 months ago 15-01-2019 00:29:07 (UTC +01:00) Italian time and geographic coordinates (lat, lon) 44.38, 12.3 at 21 km depth.
POLITO_c_003	IT	NA	1620-06-22	Ravennate	region		multiscope	social, economic	Barietta (1901) reports an earthquake in Romagna on 16-18 July 1621.	natural	Geophysical Event	Earthquake		earthquakes			NA	severe	Richter	7 or 8																	High	QB - specific hazards and urban/territorial scale		Archivio Storico Macrosismico Italiano. Camassi R., Castelli V., Molin D., Bernardini F., Caracciolo C. H., Ercolani E., Postpischl L., 2011. Materiali per un catalogo dei terremoti italiani: eventi sconosciuti, rivalutati o riscoperti. Quaderni di Geofisica, 96, Istituto Nazionale di Geofisica e Vulcanologia (INGV), Roma, 53 pp.	https://emidius.mi.ingv.it/ASMI/event/1620062_0000_000	
POLITO_c_004	IT	NA	479-08-25	Ravenna	city		social		The earthquake was felt but there were no other effects (Scossa di terremoto. Non sono indicati altri effetti)	natural	Geophysical Event	Earthquake		earthquakes			NA		Richter	3.9																	High	QB - specific hazards and urban/territorial scale		CFTISMed, Catalogo dei Forti Terremoti in Italia (461 a.C.-1997) e nell'area Mediterranea (760 a.C.-1500). Istituto Nazionale di Geofisica e Vulcanologia (INGV)	http://storing.ingv.it/cfti/cfti5/quake.php?500602T	
POLITO_c_005	IT	NA	443-04-15	Ravenna	city		social		The earthquake was felt but there were no other effects (Scossa di terremoto. Non sono indicati altri effetti)	natural	Geophysical Event	Earthquake		earthquakes			NA		Richter	3.9																	High	QB - specific hazards and urban/territorial scale		CFTISMed, Catalogo dei Forti Terremoti in Italia (461 a.C.-1997) e nell'area Mediterranea (760 a.C.-1500). Istituto Nazionale di Geofisica e Vulcanologia (INGV)	http://storing.ingv.it/cfti/cfti5/quake.php?500623T	
POLITO_c_006	IT	NA	467-00-00	Ravenna	city		social		Il terremoto causò spavento in città. Non sono indicati altri effetti	natural	Geophysical Event	Earthquake		earthquakes			NA		Richter	4.3																	High	QB - specific hazards and urban/territorial scale		CFTISMed, Catalogo dei Forti Terremoti in Italia (461 a.C.-1997) e nell'area Mediterranea (760 a.C.-1500). Istituto Nazionale di Geofisica e Vulcanologia (INGV)	http://storing.ingv.it/cfti/cfti5/mainpg.php?241374.000.0ff	
POLITO_c_007	IT	NA	492-05-26	Ravenna	city		social		It was felt in Ravenna, there are no impacts specifically described.	natural	Geophysical Event	Earthquake		earthquakes			NA		Richter	3.9																	High	QB - specific hazards and urban/territorial scale		CFTISMed, Catalogo dei Forti Terremoti in Italia (461 a.C.-1997) e nell'area Mediterranea (760 a.C.-1500). Istituto Nazionale di Geofisica e Vulcanologia (INGV)	http://storing.ingv.it/cfti/cfti5/quake.php?500635T	The sources report that there was an earthquake, without indicating other details
POLITO_c_008	IT	NA	501-10-09	Ravenna	city		social		It was felt in Ravenna, there are no impacts specifically described.	natural	Geophysical Event	Earthquake		earthquakes			NA		Richter	3.9																	High	QB - specific hazards and urban/territorial scale		CFTISMed, Catalogo dei Forti Terremoti in Italia (461 a.C.-1997) e nell'area Mediterranea (760 a.C.-1500). Istituto Nazionale di Geofisica e Vulcanologia (INGV)	http://storing.ingv.it/cfti/cfti5/quake.php?500637T	The sources report that there was an earthquake, without indicating other details
POLITO_c_009	IT	NA	502-05-14	Ravenna	city		multiscope			natural	Geophysical Event	Earthquake		earthquakes			NA																				High	QB - specific hazards and urban/territorial scale		CFTISMed, Catalogo dei Forti Terremoti in Italia (461 a.C.-1997) e nell'area Mediterranea (760 a.C.-1500). Istituto Nazionale di Geofisica e Vulcanologia (INGV)	http://storing.ingv.it/cfti/cfti5/quake.php?500638T	
UNIBO_c_001	IT	NA	725	Ravenna	city		multiscope	social, cultural	The quake caused the facade of Sant'Apollinare Nuovo to collapse. Damages to other buildings. This is one of the most intense earthquake in the area with its epicentre in the city.	natural	Geophysical Event	Earthquake		earthquakes			NA	severe	Richter	5.6												2 (reported)					High	QB - specific hazards and urban/territorial scale		CFTISMed	http://storing.ingv.it/cfti/cfti5/quake.php?500719T	
UNIBO_c_002	IT	NA	1483/08/11 19:40 GMT	Romagna	region		multiscope	cultural, social, environmental, economic	The epicentre was 29.3 Km from Ravenna.	natural	Geophysical Event	Earthquake		earthquakes			NA	intense	Richter	5.7																	High	QB - specific hazards and urban/territorial scale		Istituto Nazionale di Geofisica e Vulcanologia (INGV) *Guidoboni E. e Comastri A., Catalogue of earthquakes and tsunamis in the Mediterranean area from the 11th to the 15th century.*	http://storing.ingv.it/cfti/cfti5/quake.php?500468T http://www.cfti.it/cfti-repository/pdf_9/2011-16-201411_8.pdf	"There was substantial damage at Ravenna, especially to older buildings" Guidoboni E. e Comastri A., *Catalogue of earthquakes and tsunamis in the Mediterranean area from the 11th to the 15th century*. Roma-Bologna 2005.
UNIBO_c_003	IT	NA	1636/05/27-28	Ravenna	city		social		On the night between the 27th and 28th May 1636 the water of the rivers Ronco and Montone submerged the city for over two metres. The flooding from the banks occurred after six days of uninterrupted rain.	Natural	Hydrological	Flood		floods			NA	severe														140	320					High	QB - specific hazards and urban/territorial scale		Archivio di Stato di Ravenna e Sezione di Faenza; Alessandro Luparini, *Il Cinquecento in Storia di Ravenna*, Cesena, Il Ponte Vecchio, 2016, p. 259.	https://ajcravenna.beniculturali.it/index.php/2019/05/a-la-terribile-inondazione-del-1636/	
UNIBO_c_004	IT	NA	1688/04/11 12:20 UT	The epicentre is near Lugo (RA), 20.6 km from Ravenna	region		multiscope	cultural, social, environmental, economic	The earthquake caused heavy damage to the houses and public buildings of the city: there were widespread injuries and partial collapses; many chimneys and gutters fell and some people were slightly injured.	Natural	Geophysical Event	Earthquake		earthquakes			NA	severe	Richter	5.8	50																	High	QB - specific hazards and urban/territorial scale		Istituto Nazionale di Geofisica e Vulcanologia (INGV)	http://storing.ingv.it/cfti/cfti5/quake.php?501503T	Reported damages to Ch: in the Church of S. Agata Maggiore the apse was seriously damaged and the mosaic that decorated it completely fell down; in the church of S. Vitale the bell tower that fell on the cloister of the adjacent monastery collapsed almost completely; in the Duomo the bell tower was seriously damaged and became dangerous; in the church of S. Apollinare Nuovo the vault of a chapel collapsed; in the church of the Jesuits partially collapsed once.
UNIBO_c_005	IT	NA	1781/07/4-17	Romagna	region		multiscope	cultural, social, environmental, economic	The epicentre was 23.7 km from Ravenna. The several consequent quakes caused damages in the cities of Romagna. It was felt in the whole area between Lucca and Vicenza.	Natural	Geophysical Event	Earthquake		earthquakes			NA	intense	Richter	5.6/5.9	26											39% of total building within the area	13% of total buildings					High	QB - specific hazards and urban/territorial scale		Istituto Nazionale di Geofisica e Vulcanologia (INGV)	http://storing.ingv.it/cfti/cfti5/quake.php?501562T	In particular in Ravenna damages were reported to the apostolic palace, the cathedral and the churches of S.Giovanni Battista della Catene, S.Domenico, S.Giovanni Evangelista and S.Maria di Porto.
UNIBO_c_006	IT	NA	1973/03/07-08	Ravenna	city		multiscope	economic, social, environmental, cultural	In the province of Ravenna an area of about 20 square kilometres is flooded by overflowing of the local hydrographic network.	Natural	Hydrological	Flood		floods			NA	intense																				High	QB - specific hazards and urban/territorial scale		Carlinoci V., *Il dissesto geologico e geoambientale in Italia . Emilia Romagna*, pag. 109	http://www.isprambiente.gov.it/it/pubblicazioni/periodici-tecnici/rapporti-descrittivi-della-carta-geologica-d-italia/rapporti_47_csgi_emiliane.pdf	The sources report that there was a flooding due to the overflowing of the local hydrographic network and its extension
UNIBO_c_007	IT	NA	1974/03/24-25	Chiesa di Santa Croce	building		multiscope	cultural, economic	It is reported the leakage of black water from the sewer of via Galla Placidia that affects the lower level of the excavations of the archaeological area.	Natural	Hydrological	Flood		floods			NA	medium																				High	QA - specific hazards and building/district scale		Archivio Storico Pratiche Soprintendenza Archeologica Belle Arti e Paesaggio Ravenna, pratica n° 1417 del 25/03/1974		
UNIBO_c_008	IT	NA	1979/12/22	Ravenna	cross-regional		multiscope	economic, social, environmental, cultural	The Province of Ravenna, in particular the cities along the coast, are flooded by the Adriatic Sea. This is the most disastrous event in years recorded in the area.	Natural	Hydrological	Flood	Coastal flood	multihazards	floods, subsidence		NA	severe																site newspaper article (reports are in the old Italian spelling)						High	QB - specific hazards and urban/territorial scale		Montanari A., *«Come un maremoto»: quarant'anni fa l'alluvione che fece andare sott'acqua la costa* in 'Ravenna e Dintorni', 22 dicembre 2019 Progetto europeo MICORE Perini L., et al. (a cura di), *Le mareggiate e gli impatti sulla costa in Emilia-Romagna 1946-2010*, Ravenna, I quaderni di Arpae, 2011.	https://www.ravennaedintorni.it/cronaca/2019/12/22/un-maremoto-quarantanni-lalluvione-fece-andare-sottacqua-la-costa/ https://www.arpae.it/cms3/documenti/_cerca_doc/ea/ebrm_arpae/atlantemareegiacomelettaweb.pdf	This event directly led to the "Legge Ravenna" (n. 845/1980, special law for the defence of the coast that provided special funds to finance the protection works necessary to avoid new floods over ten years. In the following years, it allowed for embankments, studies and strengthening works to be carried out throughout the territory.
UNIBO_c_009	IT	NA	1981/06/22-23	Ravenna	city		multiscope	economic, social, cultural	The city floods after an abnormal event of incessant rain for several days. The city's monuments were closed to the public because inaccessible due to the water level.	Natural	Hydrological	Flood		floods			NA	intense																				High	QB - specific hazards and urban/territorial scale		Archivio Storico Pratiche Soprintendenza Archeologica Belle Arti e Paesaggio Ravenna, pratica n° 4876 del 23/06/1981		
UNIBO_c_010	IT	NA	1992/12/08-09	Ravennate	cross-regional		multiscope	cultural, social, environmental, economic	A strong swell of the Adriatic Sea caused the overflowing of the Candiano canal in the harbour of Ravenna leading to the flooding of part of the city.	Natural	Hydrological	Flood	Coastal flood	floods			NA	medium																				High	QB - specific hazards and urban/territorial scale		Progetto europeo MICORE Perini L., et al. (a cura di), *Le mareggiate e gli impatti sulla costa in Emilia-Romagna 1946-2010*, Ravenna, I quaderni di Arpae, 2011.	https://www.arpae.it/cms3/documenti/_cerca_doc/ea/ebrm_arpae/atlantemareegiacomelettaweb.pdf	
UNIBO_c_011	IT	NA	1995/06/06	Chiesa di Santa Croce	building		multiscope	cultural, economic	The church was flooded due to the incessant rain of the previous days. The soil collapsed inside the building. The mosaics were covered with a consistent layer of mud for some days.	Natural	Hydrological	Flood		floods			NA	medium																				High	QA - specific hazards and building/district scale		Archivio Storico Pratiche Soprintendenza Archeologica Belle Arti e Paesaggio Ravenna, pratica n° 8486 del 7/06/1995		
UNIBO_c_012	IT	NA	2002/05/15	Chiesa di Santa Croce	building		multiscope	cultural, economic	It is reported a small flooding due to malfunction of the water pumps. In this period, the pumps were activated manually every morning to prevent the area from flooding.		Hydrological	Flood		floods			NA	soft																				High	QA - specific hazards and building/district scale		Archivio Storico Pratiche Soprintendenza Archeologica Belle Arti e Paesaggio Ravenna, pratica del 15/05/2002		
UNIBO_c_013	IT	NA	2016/03	Chiesa di Santa Croce and its proximity	district		cultural		The area is flooded due to a malfunction of the water pumps and a raise in the groundwater level. The flood interested also the other Placidian monuments in the proximity.	Natural	Hydrological	Flood		multihazards	floods, subsidence		NA	medium			0	0	0	0	0	0	0	0											High	QA - specific hazards and building/district scale		Archivio Storico Pratiche Soprintendenza Archeologica Belle Arti e Paesaggio Ravenna		The SBAP di Ravenna coordinated the intervention for drainage. We are made aware of this emergency directly by the officers of the Soprintendenza event but no written documentation could be found in the archives.
UNIBO_c_014	IT	NA	2019/08/16-19	Chiesa di Santa Croce	building		multiscope	cultural, economic, environmental	The shutdown of the water pumping system, worsened by some intense weather conditions, like an unusual rise in the water level and other problems linked to the city's water networks, caused a quick flooding of the archaeological site and the Church	Natural	Hydrological	Flood		multihazards	floods, subsidence		NA	medium			0	0	0	0	0	0	0	0											High	QA - specific hazards and building/district scale		RavennaToday, Archivio Soprintendenza	http://www.ravennatoday.it/cronaca/alghe-acqua-allagamento-chiesa-santa-croce-galla-placidia.html	The interventions for the drainage of the area could only take place after some days from the first event, due to the particular time of the year in which it occured. UNIBO has further information regarding type of pumps used during the drainage, time, methods for cleaning the area.

Material Received from Dordrecht

19 november 1421: sint Elisabeth flood

In the night prior to November 19, 1421, a large part of the south-west of the Netherlands experienced a severe storm. A combination of this severe storm with high tide eventually caused the disaster. Moreover, during the flood the water level in the rivers was very high as well because of the previous wet period. The first dyke breach occurred at the village of Broek, which was situated south-west of Dordrecht. After this dyke breach, the water slowly entered the polder. The hole in the dyke was closed and the area would be ground dry. But before the work was finished, a second dyke breach followed in Werkendam, located in the east of Dordrecht. Making it virtually impossible to get the area dry. In the end the event caused about twenty villages to be flooded. Because of the lack of population registration at that time there are no concrete numbers of deaths. Ten thousand or a hundred thousand deaths were mentioned, but a more realistic estimate is about two thousand deaths.

12 march 1906: storm surge of 1906

Storm surge paired with extreme south-west winds. The most damage was done in the Dutch province of Zeeland and part of Belgium. The amount of victims was limited because the flood occurred during the day, however the damage was still massive. The water levels measured during the storm surge were extremely high and not topped until the ''watersnoodramp'' in 1953. This surge did not hit Dordrecht, but it happened quite close to the city. 1953 is very well remembered, the 1906 flood much less.

-Dutch newspaper about the flood in Zeeland: https://krantenbankzeeland.nl/issue/mco/1906-03-24/edition/0/page/1

13 jan 1916: storm surge of 1916

There was a storm surge that, together with high discharge on the rivers, breached many dikes across the country. The storm surge flooded land in the following provinces: Groningen, Friesland, Overijssel, Gelderland, Utrecht, Noord-Holland and Zuid-Holland. In Dordrecht specifically the high discharge from the rivers couldn't flow into the sea because of the storm surge, this caused the rivers to breach the dikes.

-English source: http://www.deltawerken.com/Zuider-Zee-flood-(1916)/306.html

-Dutch source: https://www.nemokennislink.nl/publicaties/1916-de-watersnoodramp-die-nederland-veranderde/

-Pictures: https://beeldbank.regionaalarchiefdordrecht.nl/index.cfm?action=search.query&Q.field1=term&Q.value1=overstromingen&tohistory=1

31jan / 1 feb 1953: waternoodsramp

Storm surge, spring tide and storm with heavy wind. The watersnoodramp is the biggest natural disaster in post-war Netherlands. This was a flood of extreme proportions, in the Netherlands over 1830 people died because of it, many people lost their homes and possessions, tens of thousands of animals died, many buildings were destroyed and large part of land were submerged. Parts of Belgium and the United Kingdom were flooded, resulting in casualties in

these countries as well. This event was the main reason for the Netherlands to improve their coastal defence with the Delta works.

-This is what the city centre of Dordrecht looked like on the first of February:

https://www.youtube.com/watch?v=gVWnhRDKzm4 The original source is in the description of the video.

-Here are pictures of what Dordrecht and surroundings looked like on the first of February:

https://beeldbank.regionaalarchiefdordrecht.nl/index.cfm?Q.searchterm=1953+water&action=search.find&tohistory=1&startrow=0

-A link to an English page from the Dutch Ministry of Infrastructure and Water Management about "The flood of 1953": https://www.rijkswaterstaat.nl/english/water/water-safety/the-flood-of-1953/index.aspx

-A link to a Dutch page from the Royal Netherlands Meteorological Institute about how such an event occurred:

https://web.archive.org/web/20140424140659/http://www.knmi.nl/cms/content/24315/waterstoodramp_1953

31 jan 1995: close call for riverine flooding

December 1994 had an extraordinarily high amount of rain which carried on in January of 1995, this along with the already high water levels resulted into the decision to start evacuating people. At Lobith the water level of the Rhine increased by 2 meter within a day, while at Zaltbommel the water level of the Waal increased by one meter. On the 31st of January water levels at Lobith reached a record height of 16,63 NAP. Evacuation estimates lie at about a quarter of a million people. This event was a big wake-up call that made the Dutch more aware of the dangers of fluvial flooding and was a big inspiration for the 'room for the river' project.

-A Dutch article listing areas at risk of flooding (including Dordrecht) and where evacuation has taken place and will take place: https://www.volkskrant.nl/nieuws-achtergrond/op-de-loop-voor-het-dreigende-water~b2768783/?referer=https%3A%2F%2Fwww.google.com%2F

-Dutch article briefly going over the events and the plans that came forth from this close call: https://mijngelderland.nl/inhoud/specials/verbeelding-van-de-waal/de-bijna-ramp-1995

Dec 2016/1 feb 2020: small scale flooding old city centre

The old city Centre of Dordrecht is always at risk of small scale flooding, most of the houses and inhabitants have adopted to the situation. During the period mentioned above, mainly early on in the year, the old city centre of Dordrecht has been partially flooded or was close to doing so multiple times. The main causes are spring tide, extreme winds, storms and high river discharge. Below are some articles from local newspapers and the municipality warning for and reporting flooding.

https://www.ad.nl/dordrecht/storm-en-neerslag-zorgen-voor-hoge-waterstand-dordt~a33b939e/

https://indebuurt.nl/dordrecht/nieuws/weer/oh-nee-het-kan-morgen-overstromen-in-dordrecht~70254/

https://www.dordrecht.net/nieuws/2020-02-10-25671-kades-overstromen-bij-hoog-water.html

https://cms.dordrecht.nl/Inwoners/Overzicht_Inwoners/Nieuws/Nieuwsarchief/2019/Januari/Hoge_waterstand_DATUM_beperkte_kans_op_overlast_ORIGINEEL

https://indebuurt.nl/dordrecht/nieuws/weer/hier-kun-je-op-10-en-11-februari-last-hebben-van-hoogwater-in-dordrecht~105688/

Material Received from Galicia

We are still working on the information requested about historical events occurred in our Open Lab.

- In the Excel attached you will find the *number of fires*, *forest surface burnt in Ha* per council (period from 2001 to 2006). After 2006 the table collects the number of fires, surface burn (forest surface and total surface) for the whole area per year (2007-2018).
    - Note: The area XV includes the natural park and its surroundings. The classification of districts it´s been made for forestry managing purposes (including fires prevention).
    - Galicia districts (forest managing areas)

- This map includes dates of the event, Ha burnt and principal origin cause of the fire (from 2001 and 2014). It is not an official source, but it seems quite complete. Under the map, there are some links to downloaded the data of the layers:- https://hgrosado.carto.com/viz/478c85bd-0be4-4118-985b-c6052bc0f459/public_map
- About additional information, there are some reports about the fires of 2006 but, most of them are in Galician. I believe the summary that Louis made was quite complete. Anyway, in this document (English) there is also an assessment about the impact of the fires of 2006 in the natural heritage in Galicia (see the chapter about *ASSESSMENT OF POSSIBLE DAMAGE ON NATURA 2000 SITES IN GALICIA (SPAIN)*).
- Regarding the images. I think there is not such a thing as a Picture database of fires in Galicia but, I could send you some pictures that were published on newspapers (on-line edition), so let me know if that would be useful I will make a quick search and send some to you. What kind of pictures do you need? during fires? after fires?

Example: Muiños council after a fire in 2016

During a fire inside the natural park in 2017

I hope this information is useful. I hope to write you again next week with more specific information about the historical fires.

Material Received from Sava River

Please find the following resources which could help you on your task:

- Flood Risk Management Plan for the Sava River Basin Planhttp://www.savacommission.org/sfrmp/en/draft/show-12-sava-frmp
- Public SAVA GIS Geoportal http://www.savagis.org/ within you can find the list of flood events with date and some details, maps to visualize the areas affected and (on the right side) SAVA HIS historical data
- public **Wms**: http://savagis.org/wms (you need a GIS software)
- SAVA data examples in Sharepointhttps://tecnalia365.sharepoint.com/:f:/r/sites/t.extranet/sp070767/Shared%20Documents/SHELTER/WP1/T1.1/DataExamples/WP7?csf=1&e=LDRf7c
    - to have an idea and overview of existing database for flood management
    - samples of Sava HIS in WaterML format (real-time and processed data),
    - samples of Sava GIS in SHP format (Flood Events polygons and points)

Regarding the severity of the events please note that the classification is linked to the definition of the Areas of Potentially Significant Flood Risk (APSFR) which changes for each Member State (see Floods Directive). In the Flood Risk management Plan you will see SAVA Parties should prepared flood hazard and risk maps at the Sava River basin level for all identified APSFRs, based on two scenarios:

- floods of medium probability for the 100 years return period,
- floods of low probability or extreme events, regardless of the return period considered by the country and refers to the probability of occurrence in 100 years

I hope this can help you to collect the data.