CEN/WS ARCH

Date: 2022 – 02

prCWA 17727:2022

Secretariat: DIN

City Resilience Development — Framework and guidance for implementation with a specific focus on historic areas

Entwicklung resilienter Städte — Rahmenbedingungen und Leitlinien zur Implementierung in historischen Gebieten

Développement des villes résilientes — Cadre et lignes directrices pour la mise en œuvre dans les zones historiques

ICS: 13.020.20

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European foreword

CWA 17727:2022 was developed in accordance with CEN-CENELEC Guide 29 “CEN/CENELEC Workshop Agreements” and with the relevant provision of CEN/CENELEC Internal Regulations – Part 2.

The proposal was approved and supported by CEN following a public call for participation made on 2021-04-28. The Kick-off Meeting took place on 2021-05-26 and the final draft CWA was approved by representatives of interested parties in a Workshop on 2022-01-19. It does not necessarily reflect the views of all stakeholders who may have an interest in its subject matter.

Results incorporated in this CEN Workshop Agreement received funding from the European Union’s Horizon 2020 research and innovation program under the grant agreement numbers 820999 (ARCH), 821282 (SHELTER), and 833671 (RESILOC). The final draft text of CWA 17727:2022 was submitted to CEN for public commenting on 2022-02-11.

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Introduction

Resilience of historic areas

While negative impacts of climate-related and other hazards on urban areas are widely discussed in contemporary literature and research, their impacts on cities and communities, which are inextricably linked to historic areas, have not yet been studied extensively. Combined work on disaster risk reduction and climate change adaptation in and for historic areas, with their unique structure, calls for advanced technologies, models, methods, processes and tools. To make a historic area resilient, municipal staff, practitioners and decision-makers need to address both the chronic stresses posed by climate change as well as the shocks and existing risks posed by other disasters. However, to date, typical management frameworks for disaster risk management (DRM) and climate change adaptation (CCA) still consider shocks and chronic stresses in isolation. Furthermore, the term "city resilience" or additionally, "community resilience" can mean many different things to different actors, depending on the context in which it is applied.

The ARCH DRM/CCA Framework

The aim of the CEN/WS ARCH was to further develop, together with a broader community of experts, including municipal staff, the DRM/CCA Framework, which has been initially developed by the ARCH project. The framework was created to help, for example, practitioners, decision-makers, heritage managers, public administrators, and other actors in the field of DRM, CCA, and historic area management to:

- acknowledge the need for socially just resilience building activities,
- understand which steps are necessary to develop a Resilience Action Plan, which combines both processes (DRM and CCA) and takes needs and opportunities of historic areas into account when building resilience,
- provide guidance on how to operationalize the different steps of the DRM/CCA Framework,
- provide guidance on which stakeholders to involve in each step of the DRM/CCA Framework,
- provide a conceptual structure for the use of different supporting tools and materials within the steps of the DRM/CCA Framework.

The content in this document is based on the DRM/CCA Framework of the ARCH project, which centres on historic areas. Nonetheless, the framework can also be applied to other use cases in other parts of a given city, not necessarily only on historic areas.

The framework takes the DRM cycle proposed by Jigyasu, King, and Wijesuriya in the UNESCO manual on managing disaster risk for world heritage [1] as a starting basis and extends it with the climate change adaptation planning cycle of climate-ADAPT's Urban Adaptation Support Tool [2]. This combined planning cycle is then further extended with considerations from topic-specific frameworks, like the Culture in city Reconstruction and Recovery Framework [3], the SMR European Resilience Management Guideline [4], and the RESIN Conceptual Framework [5].

CWA 17300 series on City Resilience Development

This document complements the already existing standards series CWA 17300 on City Resilience Development. This supports the uptake and consideration of the standards content in relation to enhance resilience in cities and communities. The standards series consists of the following documents:

- CWA 17300 City Resilience Development – Operational Framework
- CWA 17301 City Resilience Development – Maturity Model
- CWA 17302 City Resilience Development – Information Portal

131 The CWA on Operational Guidance is the overarching document that refers to the CWA 17301 City
132 Resilience Development – Maturity Model, the CWA 17302 City Resilience Development – Information
133 Portal, as well as to other supporting tools.

1 Scope

The document specifies a resilience-building framework for historic areas within cities and communities that defines and combines disaster risk management (DRM) and climate change adaptation (CCA) activities in an integrated approach. The framework is applicable for historic areas that face natural and climate change-induced hazards. The framework includes a:

- characterisation of historic areas and their exposure to natural and climate change-induced hazards,
- set of requirements and recommendation on how historic areas can become more resilient,
- step-by-step process to manage disasters, and to perform and monitor resilience-building activities.

This document is intended to be used by decision makers and technical staff at the city/community and historic area levels, as well as by councillors working on risk and vulnerability assessment, climate change adaptation and resilience enhancement. Other stakeholders who may wish to use the document include heritage managers, public administrators, sustainability and resilience officers, critical infrastructure managers, service providers, emergency service providers, civil society associations, non-governmental organizations, academic and research institutions, as well as consultancies.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1

chronic stress

underlying human and natural pressure or tension that causes persistent negative impacts relating to environmental degradation and economic instability

[SOURCE: modified ISO 37123:2019-12, definition 3.9]

3.2

city

community

human settlement formed by a central area, neighbourhoods and suburbs reciprocally connected but not necessarily coincident with administrative boundaries, and inclusive of all the urban stakeholders that play key roles in its functioning

[SOURCE: CWA 17300:2018-08, definition 3.5]

3.3

climate change

change in climate that persists for an extended period, typically decades or longer

Note 1 to entry: Climate change can be identified by such means as statistical tests (e.g. on changes in the mean variability).

Note 2 to entry: Climate change might be due to natural processes, internal to the climate system, or external forcing such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use.

[SOURCE: ISO 14090:2020-02, definition 3.5]

3.4

climate change adaptation

process of adjustment to actual or expected climate and its effects

Note 1 to entry: In human systems, adaptations seeks to moderate or avoid harm or exploit beneficial opportunities.

Note 2 to entry: In some natural systems, human intervention can facilitate adjustment to expected climate and its effects.

[SOURCE: ISO 14090:2020-02, definition 3.1]

3.5

disaster

situation where widespread human, material, economic or environmental losses have occurred which exceeded the ability of the affected organization, community or society to respond and recover using its own resources

[SOURCE: ISO 22300:2021-02, definition 3.1.73]

3.6

disaster risk reduction

application of policies 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

[SOURCE: modified ISO 22300:2021-02, definition 3.1.74]

3.7

emergency

unforeseen or unplanned situation, which has life-threatening or extreme loss implications and requires immediate attention that is directly given

EXAMPLE Child falls into a fast running river.

[SOURCE: modified ISO 22300:2018-02, definition 3.77]

3.8

framework

system of requirements and recommendations designed to support the accomplishment of disaster risk management and climate change adaptation (3.4)

3.9

hazard

source of potential harm

[SOURCE: ISO 22300:2021-02, definition 3.1.110]

3.10

historic area

any group of buildings, structures and open spaces including archaeological and paleontological sites, constituting human settlements in an urban or rural environment, the cohesion and value of which, from the prehistoric, archaeological, architectural, industrial, historic, aesthetic or sociocultural point of view are recognized

EXAMPLE Prehistoric sites, historic towns, old urban quarters, villages and hamlets as well as homogeneous monumental groups.

[SOURCE: Adapted from UNESCO Recommendation Concerning the Safeguarding and Contemporary Role of Historic Areas. Nairobi, 1976]

3.11

historic urban landscape

urban area understood as the result of a historic layering of cultural and natural values and attributes, extending beyond the notion of "historic centre" or "ensemble" to include the broader urban context and its geographical setting

[SOURCE: UNESCO. (2011). Recommendation on the Historic Urban Landscape adopted by the General Conference at its 36th session]

3.12

impact

evaluated consequence of a particular outcome

[SOURCE: IEC 62443-3-3 Corrigendum 1:2014-04, definition 3.1.27]

3.13

resilience

ability of a historic area (3.10) as a social-ecological system (3.21) to cope with hazard (3.9) by responding and adapting in socially just ways that maintain the historic area's functions and heritage significance (including identity, integrity, authenticity)

3.14

resilience strategy

plan outlining actions to achieve a long-term or overall resilience objective

[SOURCE: modified ISO 9000:2015-09, definition 3.5.12]

3.15

resilience building process

sequence of resilience (3.13) enhancing activities

3.16
risk
effect of uncertainty

Note 1 to entry: An effect is a deviation from the expected. It can be positive, negative or both. An effect can arise as a result of a response, or failure to respond, to an opportunity or to a threat to objectives.

Note 2 to entry: Uncertainty is the state, even partial, of deficiency of information related to, understanding or knowledge of, an event, its consequence, or likelihood.

[SOURCE: ISO 14090:2020-02, definition 3.12]

3.17
risk assessment
overall process of risk identification, risk analysis and risk evaluation

[SOURCE: ISO 22300:2018-02, definition 3.203]

3.18
risk mitigation
lessening or minimising of the adverse impacts of a hazardous event

[SOURCE: ISO 22300:2018-02, definition 3.1.225]

3.19
risk prevention
process of either avoiding risks or reducing their probability

3.20
shock
natural or man-made event that causes a disaster (3.5)

EXAMPLE Flood, earthquake, volcanic eruption, hurricane, wildfire, pandemic.

[SOURCE: ISO 37123:2019-12, definition 3.8]

3.21
social-ecological system
SES
complex system of people and nature, emphasizing that humans are seen as a part of, not apart from, nature

[SOURCE: Berkes, F., Folke, C., & Colding, J. (Eds.). (2000). Linking social and ecological systems: management practices and social mechanisms for building resilience. Cambridge University Press.]

3.22
sustainability
ability of a system to be maintained for the present and future generations

[SOURCE: EN 16627:2015-06, definition 3.62]

3.23

vulnerability

intrinsic properties of something resulting in susceptibility to a risk source that can lead to an event with a consequence

[SOURCE: ISO Guide 73:2009, definition 3.6.1.6]

4 Characterisation of historic areas

This clause defines a template that should be filled out by the end users of the CWA to characterise a historic area of concern and the hazards it faces. The template assumes an understanding of a historic area as a social-ecological system (see Figure 1) that consists of the built and natural environments which make up the ecological system, and the social, cultural, economic, and policy aspects which make up the social system. These two subsystems are related to each other, with the ecological system providing functions and services to the social system and the social system conducting interventions on the ecological system. It is important to note that the social and ecological systems, as well as their elements, cannot be viewed independently from each other, but as interrelated and partially overlapping [6].

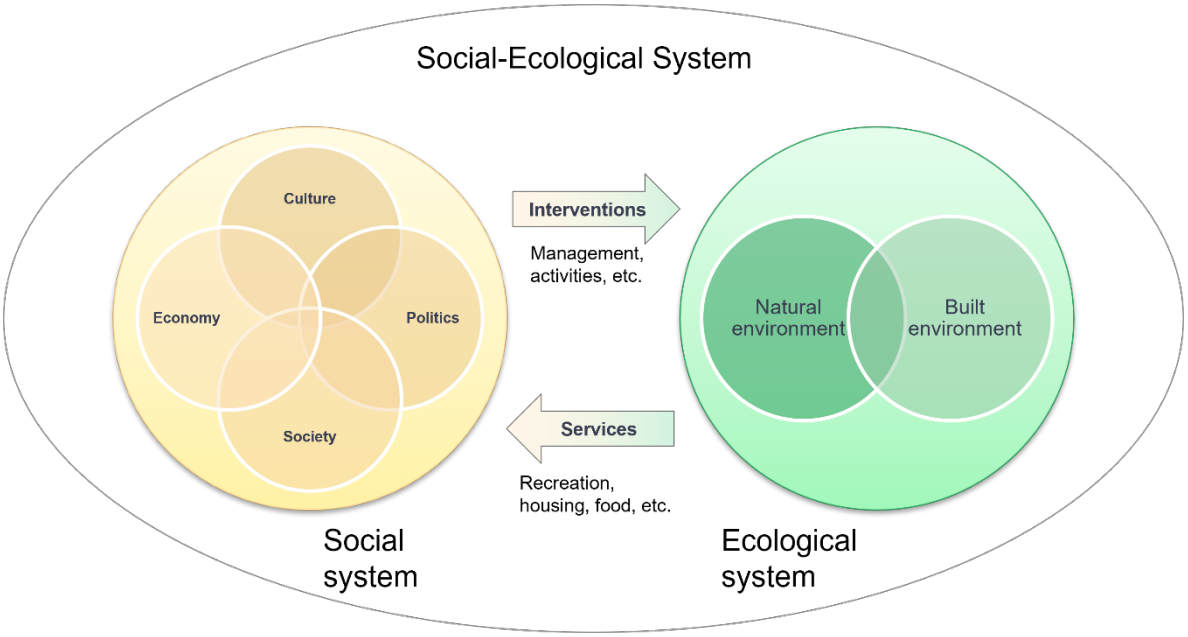

Figure 1 — Social-ecological system (SES) [9]

The template provided in Annex A should be used to describe the historic area in terms of its subsystems and constituent elements [7, 8, 9]. These include:

- ecological subsystem elements (e.g. built and natural environment, supporting infrastructures and services, movable heritage),
- social subsystem elements (e.g. intangible heritage features, economic features, policy context),
- the functions and uses of the historic area, as well as
- risk information (e.g. hazards, exposed elements, vulnerability, impacts) about the historic area.

When characterising a historic area using the template, all subsystems and their constituent elements that are essential for the functioning of the historic area, as well as for its cultural significance, should be

identified and described in detail at the appropriate section of the template. To do so, local examples for specific subsystem elements and characteristics should be given.

The identification of subsystems and elements should be done in consultation with local experts and community groups to ensure that all aspects relevant for the local population are included in the characterisation.

5 General information

This clause introduces the overall DRM/CCA Framework (see Figure 2) and how the steps and phases are connected to one another. The DRM/CCA Framework consists of ten steps spread across the three phases:

- pre-disaster phase,
- during-disaster phase, and
- post-disaster phase.

Figure 2 — DRM/CCA Framework

Resilience building cannot be achieved without a structured cyclical process. The ten steps shall be understood as consecutive but not completely distinct working stages, since they have strong interconnections and related actions. In case no disaster occurs, the steps of the normal operating phase (pre-disaster phase) shall be regularly repeated. Therefore, the first six steps are set to be repeated in regular cycles subject to specific city needs.

In the case of a disaster, the cyclic process is disrupted, and the emergency operating phase (during and post-disaster phases) shall be initiated (see Figure 2).

Activities towards a combined DRM and CCA approach might already have been initiated within the historic area, so that certain steps might already have been (partially) conducted. In other words, preparation may have laid the foundation for emergency operating phase activities even before the onset of the disaster.

In either case, the steps in the emergency operating phase depend on the preparatory plans and actions resulting from the normal operating phase. Within the post-disaster phase, a revision of actions from the pre-disaster phase shall be included to account for the need to adjust actions based on outcomes of actions taken in the emergency operating phase. The post-disaster phase shall be used to re-assess measures in order to support building back better and further strengthening the resilience of the historic area.

6 Pre-disaster – Normal operating phase

6.1 Prepare the ground

6.1.1 General information

This subclause provides information on the first step of the DRM/CCA Framework.

The first step aims at building a basis for the subsequent steps by identifying objectives, scope, and responsibilities, identifying relevant stakeholders to involve in the resilience building process from the outset, and collecting initial information and data. In other words, the first step sets the basis for operationalising resilience, as well as assessing the present resilience condition of a community and its historic areas.

In fulfilling this step, the local government creates an assessment context that later serves as the basis for setting priorities and targets for the co-creation of a resilience strategy and a resilience action plan, as well as for the monitoring of progress by making use of indicators for resilient communities and historic areas.

6.1.2 Requirements

This subclause provides requirements that have to be met to successfully perform step 1 “Prepare the ground” of the DRM/CCA Framework.

- The community and its historic areas shall engage in the **formation of a cross-sectoral resilience team or office** who works on the resilience-building process and who will be responsible for all topics, issues and challenges related to resilience. The team or office shall be responsible for mainstreaming resilience into traditional community practices. The resilience team takes on ownership and is thereby accountable for the resilience strategy development. The responsibilities among the team for the resilience management process shall be clarified.

  Note 1: Cross-sectoral resilience team or office thereafter only referred to as resilience team.

- Initial data and **key information about the community and historic area** shall be collected and screened to inform decision makers on objectives and scope of the resilience management process (see Clause 4).

  EXAMPLE Data can include, location and size of the historic area, information on ownership for buildings within the area, structural information on buildings, but also information on social, cultural and natural aspects related to the area, like existing community groups, associated local traditions, location and size of ecosystems, challenges and pressures that have led to the current situation, as well as the impacts those pressures have on various parts of the society, economy and environment, and the policies and measures already in place.

- **Initial data about relevant climate change related and natural hazards** shall be collected and screened to support limiting the scope of the resilience management process to the most relevant hazards. This might include gathering historical data about past impacts, pre-identifying potentially relevant climate change scenarios, outlining how to assess urban risks and vulnerabilities and how to develop and implement options to build resilience to these risks to ensure that a community and its historic areas can achieve its targets (see Clause 4).
- Available **data on all relevant aspects of sustainability, climate change adaptation and resilience** shall be collected and structured. Even if all the data (quantitative or qualitative, i.e. spatial data, data on economic and social conditions or demographic data) cannot be delivered during the first cycle of the DRM/CCA Framework, it still serves for identifying gaps.
- Initial data and **information about the available funding and personnel resources** shall be collected to be able to effectively define the scope and objectives and set soft boundaries of the resilience management process.

  EXAMPLE This can includes, assigning a main responsible person or team for the overall process, but also relevant departments and public/private organisations, local communities and other stakeholders to involve, especially those representing minorities or disproportionately affected population groups. This can also include local businesses, academic institutions, cultural associations, and organisations from different governance levels that might support the process with financial and human resources.
- The resilience team shall perform a **stakeholder mapping and analysis**, including stakeholders and actors relevant for the historic area and beyond.
- The **objectives and scope of the resilience management process shall be defined**. This depends on the time and resources available to the resilience team involved in the management process and shall be based on the preliminary information collected and screened.
- A **resilience baseline review** shall be established by evaluating the initial situation of the community and historic area. The baseline review is a regularly performed action conducted by the cross-sectoral resilience team. It determines the geographical and thematic scope of the resilience management framework, setting its boundary conditions.

6.1.3 Recommendations

This subclause provides recommendations on how to fulfil step 1 “Prepare the ground”.

- An **external communication and stakeholder engagement process** should be defined. Each area will need to adapt the process to its own needs, recognising prior studies and actions and the expressed priorities of its leaders, community and partners. Best outcomes may be achieved through a highly consultative, participatory and flexible approach. These include the potential use of participative methods and engagement of local communities, but also decisions about how to communicate during the management process with relevant stakeholders. The communication and stakeholder engagement process should take additional note on the possibilities heritage management and cultural activities can provide for these activities due to their high value for the local community.
- The communities or historic area’s **political representatives should be included in the approval of the implementation of the DRM/CCA Framework** to ensure successful advocacy, city resilience championing, and visibility for the resilience-building activities that will follow. By ensuring early support by the political leadership, resilience will be recognised in the city strategy and included in the planning of budgets and resources.
- The political representatives of the community and the historic areas should **share ownership for the creation of the resilience team or office** from the start, and should approve the resilience

strategy and action plan development. The resilience team should consider other cities' actions or ongoing activities related to the actions, and projects to safeguard human and financial resources.

6.1.4 Supporting materials and tools

This subclause provides a selections of supporting tools and materials useful for the current step of the DRM/CCA Framework.

The **Resilience Maturity Model (RMM)** (CWA 17301 City Resilience Development – Maturity Model) can be used to identify the present resilience maturity stage of a community, as it provides a common understanding of the resilience-building process. When using the RMM, community and the historic areas are asked to evaluate their current status of resilience. The model then helps to identify the correct activities to implement in order for the community and the historic area to evolve and move to the next maturity stage. The RMM thereby helps to assess their resilience status and to identify the ideal path for the evolution of the resilience-building process from an initial stage to a more advanced stage, going through a number of intermediate stages.

The **ARCH Resilience Assessment Dashboard** (ARCH RAD) is a web-based tool to assess how well the DRM/CCA Framework is implemented. The ARCH RAD will enable end-users to perform thorough or quick resilience self-assessments for historic areas.

The proposed hazard list included within the **UNDRR's Hazard Definition & Classification Review Technical Report** [9] might be used during the pre-identification of relevant hazards.

6.2 Assess vulnerabilities of the exposed elements and risks

6.2.1 General information

This subclause provides information on the second step of the DRM/CCA Framework.

This step refers to identifying and assessing vulnerabilities and risks to identify those areas of the community and historic area that need increased attention and in order to identify suitable measures to address these vulnerabilities and risks. The purpose of a risk assessment is to:

- ensure resilience-building activities are relevant to the community and historic area context,
- ensure the appropriate and proportionate investment of resources,
- better understand the exposure and vulnerability of the community or historic area to different shocks and chronic stresses,
- identify potential impacts, so that capabilities can be developed that will address the impacts of many risks.

6.2.2 Requirements

This subclause provides requirements that have to be successfully met to perform step 2 "Assess vulnerabilities of the exposed elements and risks" of the DRM/CCA Framework.

- The **hazards to be further analysed shall be selected**, based on the information gathered in step 1. In more detail, the resilience team identifies and analyses hazards, as well as existing, future and expected challenges. When new information, technology and tools are added to the resilience-building process, further support is needed in order to ensure that new technologies are transferred as context-appropriately as possible and to facilitate further external support through network-building.

- The team shall **perform a risk and vulnerability assessment**, which is an effective way to prioritise climate hazards and to create a shortlist for further analysis. In this step, the climate impacts are prioritised using a risk assessment matrix. The highest risks are then subjected to a vulnerability assessment. The risk and vulnerability assessment may also take place in a workshop setting. In this case, the assessment may be subjective as it depends on the opinions and personal experiences of participants. It is therefore recommended to conduct the risk assessment with a broad group of city representatives and preferably to repeat the exercise with relevant stakeholders to validate the priorities. The following activities are part of a regular risk assessment:
    - The **main exposed elements to consider for the vulnerability and risk assessment are selected**. These include those elements that are connected to the historic area as a social-ecological system (SES) (e.g. heritage assets, population, (intangible) cultural assets, as well as environmental and economic assets, and more).
    - The **scenarios for which to conduct a risk assessment** are selected, these include climate change scenarios but also urban development scenarios and other projections with relevance to vulnerability and risk factors.
    - The **sensitivities and capacities influencing the vulnerabilities** of the different exposed elements to different hazards are identified.
    - The potential **impacts are identified by evaluating historic and current information**. This includes impacts to the different elements of the SES and support disaggregating information in such a way that effects on different populations groups can be assessed. These impacts also cover (intangible) heritage values that can, for example, be captured by analysing the local population structure and the actual utilization of historic areas (such as in the case of cultural urban landscapes).
    - Finally, **cascading effects of risks** need to be considered and prioritised.
- Following the performance of a risk assessment, the resilience team shall establish a **risk database and management system**, which will include historical data on risk scenarios, assessments and mapping of vulnerabilities. The risk database and management system shall additionally include detailed methodology and guidance to perform risk and vulnerability assessment.

6.2.3 Recommendations

This subclause provides recommendations on how to fulfil step 2 of the DRM/CCA Framework.

- The resilience team should additionally undertake a **rapid assessment, identifying risks and vulnerabilities,** to help achieve a first assessment of the communities and historic areas risk profile and to commence early actions, then plan to repeat the risk assessment process later.
- The resilience team should assess the vulnerability of affected people and communities, by **identifying and mapping vulnerable groups** based on their adaptive capacity and their relevance for the historic area. The following should be considered: economic and technological resources, social capital, availability of information and skills, institutional and community support systems, political and social in/equality, access to natural resources and services, and pre-existing stresses /risks / disadvantages.
- The resilience team should **assess the degree of vulnerability of these groups to the identified risks** including potential disruptions to urban systems and services. The results should be documented on a Vulnerability Matrix showing adaptive capacity and sensitivity (level of control/ influence).
- The resilience team should **bring together a multi-disciplinary group to share knowledge about the identified risks**, including the output from regular risk assessments, and to promote a systems perspective about risks through discussing risk interdependencies and the relevant consequences.

- The resilience team should **organise workshops or discussion sessions** that may involve citizens and raise their risk awareness. As part of these workshops and sessions, participants should also receive active feedback about how their inputs have been taken-up in the process of measure identification.

6.2.4 Supporting materials and tools

This subclause provides a selection of supporting tools and materials useful for the current step of the DRM/CCA Framework.

A **Geographical Information System (GIS)** with accurate data on historic areas and risks is a pertinent tool to be used in the monitoring, evaluation and learning plan to keep track of spatially explicit information, which can also be used for communication purposes.

Impact Chains can be used to collaboratively model cause-effect relationships between hazards and potential impacts, as well as cascading effects. Impact Chains also allow to link potentially exposed elements, sensitivities and capacities to impacts, thus supporting the identification of measures.

The **Risk Systemicity Questionnaire (RSQ)**, developed by the European research project Smart Mature Resilience, can be used to identify and prioritise risk scenarios, where interdependencies between risks are shown to lead to networks of risks, including vicious cycles, and to review and prioritize mitigation and adaptation actions for various scenarios of risk interdependencies. Tool is available here: https://smr-project.eu/tools/risk-systemicity-questionnaire/ (last retrieved on 09/02/2022).

The **Climate ADAPT Urban Adaptation Map** provides, for European communities, an overview of the current and future climate hazards, the vulnerability of the communities to these hazards and their adaptive capacity. Tool is available here: https://climate-adapt.eea.europa.eu/knowledge/tools/urban-adaptation (last retrieved on 09/02/2022).

The **IVAVIA methodology** guides a risk-based vulnerability assessment, helping to map, analyse and communicate the impact of climate trends and weather events on key elements of community's physical, social and economic fabric. IVAVIA provides guidance on how to prepare, gather, and structure data for a risk-based vulnerability assessment, to quantify and combine vulnerability indicators, to assess risk, and to present outcome. Tool is available here: https://resin-cities.eu/resources/ivavia/ (last retrieved on 09/02/2022).

6.3 Identify resilience measures

6.3.1 General information

This subclause provides information on the third step of the DRM/CCA Framework.

This step aims at identifying suitable prevention, mitigation, adaptation and emergency response measures as well as strategies to lower the risk and increase the resilience of the community and historic area. It is based on the outputs from the vulnerability and risk assessment from the previous step as well as information from step 1 (see Figure 1) and additional sources.

The purpose of this step is to build a portfolio of potentially suitable measures to address risks and vulnerabilities, to identify plans and policies that may support the resilience needs, and to identify selection and assessment criteria to be used in step 4.

6.3.2 Requirements

This subclause provides requirements that have to be fulfilled to perform step 3 of the DRM/CCA Framework.

- The resilience team shall **review and analyse the results from the risk and vulnerability assessment done in step 2,** including cascading effects within the city's systems or on the historic area management. The resilience team develops its own methodology or adopts established methods to analyse cascading effects.
- When reviewing the results of step 2 and identifying potential resilience measures, the resilience team shall **bring together a multi-disciplinary group of stakeholders to identify potentially suitable measures**, including local residents and building owners, non-government organisations, academic institutions, cultural associations, and local businesses, but also representatives from disproportionately affected stakeholder groups.
- The resilience team shall **define criteria for the ranking and selection of resilience measures** to be used for the assessment of the identified measures in step 4. These criteria may include environmental effectiveness, benefit-cost analysis, co-benefits, acceptability, awareness improvement, urgency of action etc. and may provide necessary benchmarking for identifying appropriate resilience measures and for improving awareness of citizens and other stakeholders.
- The potential resilience measures shall **include policies and processes to address resilience weak points**, i.e. gaps in the resilience management process.
- When identifying potential resilience measures as well as supporting policies and processes, the resilience team shall **take specific note of local, traditional practices, and knowledge systems**.
- When identifying potential resilience measures, the resilience team shall try to (initially) **identify suitable funding opportunities and financing measures**, including using public-private-partnerships.

6.3.3 Recommendations

This subclause provides recommendations on how to fulfil step 3 of the DRM/CCA Framework.

- Potential resilience measures should be **identified using existing databases** (for climate resilience research and/or practice) **as well as local good practices** (including traditional practices and knowledge systems).
- **Additional information for potentially suitable measures** should be collected to inform the selection process. These can include information about effectiveness of measures, potential co-benefits, implementation restrictions, cost estimates, relevant standards and policies, and more. Information should be gathered from existing guidance material and other relevant example projects, consultations with experts, but also information from historical knowledge and local communities.
- The identified measures should be **described in an understandable and systematic way to facilitate assessment and selection in the next step**. This analysis should take into account local and regional specificities. In addition, it should – if possible – specifically take note of local practices and traditional knowledge available in the historic area.
- Increased awareness about all, or most, potential options is an important part of risk mitigation. Therefore**,** providing information to citizens about risks, but **also about identified potential adaptation, prevention and emergency response measures**, should be perceived as an important part of risk mitigation.
- When selecting resilience measures to be implemented, the resilience team should put significant attention on informing **citizens and business owners located or operating in the affected area or around it.** They should be informed and receive training in order to be ready to act and maintain the essential services of the city.

6.3.4 Supporting materials and tools

Building Information Models (BIM) and heritage inventories can provide additional information for the selection of measure by providing information on the condition of the historic area and (material) restrictions for application of resilience measures.

The **Climate-ADAPT platform** of the European Environment Agency can be used as an initial source for case studies, policies, and other supporting materials.

The **RESIN 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. The performance of these measures has been evaluated through an extensive review of scientific literature, with references corresponding to each measure indicated as relevant. There are two entry points to the Library: a 'quick access' entry point for a basic review of available measures, and another for a more detailed investigation.

The ARCH Resilience Measures Inventory and SHELTER Solution Portfolio provide databases of resilience measures with additional information, including cost-effectiveness assessments, co-benefits, implementation restrictions, and more.

6.4 Assess and select resilience measures

6.4.1 General information

This subclause provides information on step 4 of the DRM/CCA Framework.

In this step a prioritisation of the identified resilience (prevention, mitigation, adaptation and emergency response) measures is conducted by determining their performance with regard to enhancing resilience and safeguarding the community and historic area in a socially just way.

6.4.2 Requirements

This subclause provides requirements that have to be fulfilled to perform step 4 "Assess and select prevention, mitigation, adaptation and emergency response measures" of the DRM/CCA Framework.

- All potentially suitable **resilience (prevention, mitigation, adaptation and emergency response) measures shall be assessed** based on the selected criteria from step 3 for their effectiveness, benefit-cost, potential co-benefits, long-term effect on the historic area (including enhancing the significance of historic areas), compatibility with heritage management practices, compliance with existing regulations, long-lasting effects on the local communities, including the most vulnerable ones.
- The identified resilience (prevention, mitigation, adaptation and emergency response) **measures shall be classified and prioritised**, according to the individual community case and emergency phase. In addition, the resilience measures shall be ranked by topic (cost, speed, time to implement etc.) and through a Multi-Criteria Analysis.
- The selection process shall **include those parties involved in the implementation of the measures** and particularly local communities and other stakeholders affected by the measures or in a particularly vulnerable position.
- The **resilience team shall analyse available funding** sources that were mapped in step 1 and evaluated in step 3. This process is not linear, but iterative, and is carried out across different timescales, with the community continuously collecting information, data and tools, synthesising results and cross-evaluating them. During this process the community reviews the available funding sources and opportunities, and estimates the financial resources needed for the creation of a resilience action plan in step 5.

- Barriers to measures, such as **financial issues, existing policy limitations and/or acceptance of stakeholders** shall be considered and assessed.

6.4.3 Recommendations

This subclause provides recommendations on how to fulfil step 4 of the DRM/CCA Framework.

- For the selection of a set of the assessed prevention, mitigation, adaptation and emergency response measures to be implemented, based on risk analysis and targets for resilience, available **time and resources for implementation, and associated effects on the socio-ecological system should be considered**.
- The resilience team should **organise open consultation meetings and workshops** with relevant stakeholders for the development and internal evaluation of the resilience strategy, before its release and for awareness-raising.
- **Communication between departments and between the community and its stakeholders** should be reviewed and data belonging to the municipality should be shared between departments.
- The resilience team should also **engage with the general public to get feedback** on their work and activities and conduct a workshop to identify user-oriented approaches for the selection of measures.
- The resilience team should **use an inclusive mix of outreach options and channels**.
- The consideration of effectiveness of only one or multiple resilience measures to mitigate a hazard or risk should be avoided – instead, the resilience team should **consider the whole socio-ecological system to weight impacts and trade-offs** with a sight to wider objectives.

6.4.4 Supporting materials and tools

This subclause provides a selection of supporting tools and materials useful for the current step of the DRM/CCA Framework.

The **City Resilience Dynamics Tool (CRD)** can be used to test and validate the relationships between the different policies that could, potentially, be included in the resilience strategy of a city, and the impact of those policies in building local resilience. The CRD supports city disaster managers in diagnosing, exploring and learning about the resilience-building process by running simulations of the effects of implementing certain policies over a realistic time frame (yearly to a total of 40 years). This helps city disaster managers to explore and learn about the resilience-building process. Tool is available here: https://crd.smr-project.eu/ (last retrieved on 09/02/2022).

The **NATURVATION Urban Nature Navigator** can be used to identify tools and models to assess different nature based solutions based on the urban sustainability challenges faced.

The **ARCH Decision Support System** is a web-based, geographical information system (GIS) platform. It enables end-users to conduct scenario and risk analyses for historic areas with regard to natural hazards. The ARCH DSS combines data gathered from different sources to allow constant monitoring of historic areas as well as to predict risks and damages. This gives users a fully tool-supported process to conduct risk analysis for historic areas.

The **ARCH Inventory of Funding Opportunities** identifies public and private funding options, favouring sustainable and ethical financial solutions, in order to define and implement best practices for financing the implementation of resilience plans. New financing forms, like crowdfunding or climate bonds, are also evaluated for their suitability.

6.5 Implement selected measures

6.5.1 General information

This subclause provides information on the fifth step of the DRM/CCA Framework.

In this subclause the selected measures and procedures from step 4 are being described within a resilience action plan for the historic area that is, in general, based on the outcomes of steps 1-4. This also includes setting up (and exercising) relevant emergency response procedures, as well as preparing potential recovery and reconstruction measures.

The implementation of the resilience measures shall not only be aimed at physical measures, but also target mainstreaming resilience thinking into different governance processes and policies.

6.5.2 Requirements

This subclause provides recommendations on how to fulfil step 5 of the DRM/CCA Framework.

- A **resilience action plan shall be developed** based on the identified outcomes from step 1-4 as the assessment context is basis for setting priorities and targets for the co-creation of the plan. The resilience action plan shall match selected resilience measures and activities with specific risks and / or resilience weak points and include responsible persons for the implementation of each measure as well as an indicative schedule for implementation; in addition, a prioritisation of the activities within the plan shall be included, taking into account for instance the special needs of vulnerable groups identified and mapped during step 2.
- **Responsibilities and available resources are to be allocated for each activity in the resilience action plan**, the decision process for allocating to specific persons should be mapped. The resilience team shall perform continuous revision as well as possible adaptation of the available resources and personnel during implementation of the actions.
- The selected resilience **measures and processes shall be openly communicated to the community** and stakeholders affected by them. Therefore different channels/views should be used, as the variety of stakeholders is high.
- **Emergency response measures shall be set up**, including regular drills with relevant government and other organisations as well as communities and businesses, and the development of an Emergency Response Plan including a Salvage Plan.
- An **early warning system shall be put in place** for meteorological extremes forecast/nowcast.
- The resilience team shall **review risk prevention and mitigating measures** as well as measures for climate change adaptation, emergency response, and disaster recovery potentially suitable to address the risks and hazards identified in step 2.

6.5.3 Recommendations

This subclause provides recommendations on how to fulfil step 5 of the DRM/CCA Framework.

- If possible, **community groups** (especially nearby the historic area), businesses, NGOs, the responsible units for the historic area, regulators on national/EU/Int. level (e.g. UNESCO) and emergency response teams from neighbouring cities **should be involved in the implementation of resilience measures.** A continuous communication process (a two way communication with feedback loops) with such stakeholders should be established to evaluate impacts and effects of the resilience-building process in their normal, everyday operations.

- **Workshops should be used to communicate with the stakeholders**, including a joint assessment of these workshops with the contributing stakeholders.
- The resilience team should **establish subgroups to carry out actions**, preferably with staff from different departments and with the involvement of relevant stakeholders and partners.
- For some solutions (like Nature Based Solutions or blue-green infrastructure etc.) **establishing a collaborative governance model and long-term financing for maintenance** should be beneficial.
- **Interoperability of emergency response systems** with neighbouring cities and other authorities should be sought.

6.5.4 Supporting materials and tools

This subclause provides a selection of supporting tools and materials useful for the current step of the DRM/CCA Framework.

Regulations on the historic areas, which can strongly influence the effectiveness of measure implementation) should be consulted and considered, e.g. monument preservation regulations.

Standards and information about emergency measures should also be consulted, e.g. ISO 37123 *Sustainable cities and communities — Indicators for resilient cities*, which defines and establishes definitions and methodologies for a set of indicators on resilience in cities.

The **Copernicus Emergency Management Service (EMS)** Early Warning and Monitoring services provides continuous observations and forecasts with regards to floods, droughts and forest fires. Tool is available here: https://emergency.copernicus.eu/ (last retrieved on 09/02/2022).

6.6 Establish resilience monitoring, evaluation and learning processes

6.6.1 General information

This subclause provides information on step 6 of the DRM/CCA Framework.

In this step the effectiveness of the resilience building process, including ongoing monitoring, evaluation, and learning processes needs to be evaluated and established. These procedures should not only target implementation monitoring but monitoring and evaluation of the resilience management process to establish a continuous learning loop for improving the process and the implemented activities.

As mentioned earlier, steps 1-6 should be repeated and updated on a regular basis to ensure that up-to-date information and data is fed into the process and plans, and procedures are updated to reflect changing needs. Without a regular process, no long-term resilience can be achieved.

In case a disaster occurs earlier than the end of step 6, the regular process is interrupted, and steps 7-8 might become active.

6.6.2 Requirements

- **Establishment of a monitoring, evaluation and learning plan** including its goals and objectives shall be carried out before starting the monitoring process.
- The **resilience team shall be involved in the monitoring process** together with other relevant stakeholders as necessary to facilitate the monitoring and learning process.
- The resilience team and relevant stakeholders (also from regional and national level) shall **monitor the implementation and impact of actions and activities** in the resilience action plan. The monitoring process is defined in the resilience action plan so that it is clear what monitoring means for each community and its historic areas.

- The **people responsible for monitoring shall be included in the resilience action plan** with clear responsibilities and allocation of roles.
- The **resilience team shall check already existing relevant monitoring, evaluation and learning processes**, in literature, but also within community and historic area archives, in order to re-use them, whenever they are suitable, in order to minimise costs.
- The **resilience team should engage previously identified or new relevant stakeholders** in the resilience monitoring, evaluation and learning processes.
- A **continuous monitoring process for vulnerabilities, risks and impacts from climate change-related and natural hazards shall be established.** This includes monitoring the indicators used for the risk assessment, including non-climatic drivers such as in population and urban development.
- **Output-oriented indicators** for monitoring the implementation process of resilience measures considered in the monitoring, evaluation and learning plan shall be established.
- **Outcome and process-oriented indicators for monitoring the progress of the DRM/CCA Framework shall be established** to facilitate monitoring and learning processes. These shall include developing a theory of change to establish specific resilience-building objectives, linked to certain measures, and additional assumptions in order to end up with a coherent formulation against which an evaluation can take place.
- **A detailed resilience evaluation shall be conducted** in order to assess how well the DRM/CCA Framework has been implemented so far.

6.6.3 Recommendations

This subclause provides recommendations on how to fulfil step 6 of the DRM/CCA Framework.

- The **identification of the systems and tools** that will be **necessary to assess the resilience action plan's goals** shall take place to adapt and use, whenever possible, already existing systems and tools for monitoring.
- **Data flow identification on data monitoring identifying roles**, needed technical, economic and human resources can increase the efficiency of the monitoring, evaluation and learning process.
- The **definition of criteria for monitoring, evaluation and learning**, including e.g. human knowledge retention and self-efficacy as well as the use of targets for indicators based on the local context and aligned with the resilience plan's goals can help in the assessment of the achievements.
- A **continuous communicating mechanism** should be established to continuously inform all relevant actors, including decision-makers, but also local communities and other actors connected to the resilience-building process. The involvement of stakeholders to understand which channels would be more pertinent to be informed with will facilitate the communication.
- The **communication mechanism should try to take advantage of the potential historic areas** as well as culture and arts have in activating citizens to act when confronted with climate hazards and disasters within their community.
- The **communication of the DRM/CCA Framework and its achievements** may take place in the form of a **public dashboard** to report the advances of the resilience plan, indicators, and raise awareness.

6.6.4 Supporting materials and tools

This subclause provides a selection of supporting tools and materials useful for the current step of the DRM/CCA Framework.

The resilience team drafts and uploads onto the **Resilience Building Policies tool (RBP)** detailed case studies as part of reporting back to stakeholders. Therefore, the RBP can be used to share the results of the evaluation with politicians, stakeholders and citizens, as well as with other cities. Tool is available here: https://smr-project.eu/tools/resilience-building-policies/ (last retrieved on 09/02/2022).

ISO 37123 *Sustainable cities and communities – Indicators for resilient cities* provides definitions and methodologies for a set of indicators on city resilience. This document is applicable to any city, municipality or local government that undertakes to measure its performance in a comparable and verifiable manner, irrespective of size or location. Maintaining, enhancing and accelerating progress towards improved city services and quality of life is fundamental to the definition of a resilient city. This document is intended to be implemented in conjunction with ISO 37120 *Sustainable cities and communities – Indicators for city services and quality of life*.

7 During disaster – Emergency operating phase

7.1 Conduct emergency response procedures

7.1.1 General information

This subclause provides information on step 7 of the DRM/CCA Framework.

This subclause refers to actual emergency response procedures that need to be defined to safeguard humans and relevant heritage assets. These emergency response procedures start from the moment that a disaster takes place, assign responsibility to organisations and individuals for carrying out specific actions at projected times and places in an emergency that exceeds the capability or routine responsibility of any one agency and sets an example on how all actions shall be coordinated.

7.1.2 Requirements

This subclause provides requirements on how to fulfil step 7 of the DRM/CCA Framework.

- **Emergency response plans shall be executed** in this step, while humans, infrastructures, buildings, and ecosystems need to be secured.
- As part of the emergency response plan, **theft of collapsed or damaged fragments needs to be prevented**.
- **Emergency assistance to vulnerable groups shall be prioritised** and the **essential services of the community need to be kept running**. For this reason, a variety of stakeholders shall be identified and engaged – these stakeholders shall be invited to trainings to make sure that they understand the essential functions and procedures of this step and are able to respond adequately during the emergency operating phase.

7.1.3 Recommendations

This subclause provides recommendations on how to fulfil step 7 of the DRM/CCA Framework.

- Specifically utilities and **critical infrastructure providers should be informed and ready to act** in order to maintain essential services of the community. The resilience team should establish a communication protocol for these providers to make sure that all receive coherent and accurate information and engage on time in the emergency response plan.
- **Effective communication between emergency response services and disaster response team** should be ensured. The resilience team should become a facilitator and connector the between emergency response services and the disaster response team.

824 – Every historic area management team should have at least a **nominated person responsible for the**
825 **salvage plan**.

826 ### 7.1.4 Supporting materials and tools

827 The **Copernicus EMS on Demand Mapping** provides on-demand detailed information for selected
828 emergency situations that arise from natural or man-made disasters anywhere in the world.

829 The **Resilience Building Policies tool (RBP),** already mentioned in step 6, offers a collection of case
830 studies as a reference for cities for further information. The Resilience Building Policies tool shows
831 replicable examples of successful and effective initiatives that cities have taken to build resilience locally
832 before, during and after a disaster takes place.

833 **ISO/TC 292 on Security and Resilience** is an international technical standardisation committee that
834 develops standards on emergency management, e.g.:

835 – ISO 22320 Security and resilience – Emergency management – Guidelines for incident management,

836 – ISO 22322 Societal security – Emergency management – Guidelines for public warning,

837 – ISO 22329 Security and resilience – Emergency management – Guidelines for the use of social media,
838 in emergencies.

839 # 8 Post-disaster – Emergency operating phase

840 ## 8.1 Assess needs and impacts

841 ### 8.1.1 General information

842 After the initial phase of the disaster is over and emergency procedures have been conducted, damages,
843 impacts, and needs have to be assessed. The results from the damage and needs assessment should
844 ideally inform a subsequent update of the risk assessment before the reconstruction phase in order to
845 inform decision making and support building back better.

846 ### 8.1.2 Requirements

847 This subclause provides recommendations on how to fulfil step 8 of the DRM/CCA Framework.

848 – **Differentiated assessments shall be conducted**, including damages to tangible and intangible
849 historic areas, as well as historical housing stock, damages to and needs of creative and cultural
850 industries, needs of the population, with specific focus on minorities and population groups
851 disproportionately affected by disasters. This also includes damage and needs assessments with
852 specific focus on climate change adaptation and environmental issues in order to avoid that
853 stabilizing and reconstruction measures at a later point worsen the environmental situation.

854 – Relevant **data and information** (e.g. from rapid risk assessments) **needs to be systematically**
855 **collected** to inform the following steps. This data and information shall be checked on a rotating and
856 ongoing basis, to make sure that there are no inconsistencies.

857 ### 8.1.3 Recommendations

858 This subclause provides recommendations on how to fulfil step 8 of the DRM/CCA Framework.

859 – The resilience team should **develop an inventory of damages**, making use of current observations,
860 previous knowledge and databases.

- The resilience team should **promote and support decisions by public authorities on recovery measures** (e.g. decide on what can be restored and what should be classified as total losses).

8.1.4 Supporting materials and tools

This subclause provides a selection of supporting tools and materials useful for the current step of the DRM/CCA Framework.

Rapid mapping services to ensure provision of geospatial information after the occurrence of a disaster can be used, e.g. from Copernicus.

Tool is available here: https://emergency.copernicus.eu/mapping/ems/rapid-mapping-portfolio (last retrieved on 09/02/2022).

8.2 Stabilise situation

8.2.1 General information

In this subclause, the most urgent stabilising measures (e.g. retrieve and safely storing movable heritage assets like paintings, etc.) are performed to enable the following recovery and building back better procedures.

8.2.2 Requirements

This subclause provides requirements on how to fulfil step 9 of the DRM/CCA Framework.

- The resilience team shall **coordinate and communicate with relevant actors** involved in implementing stabilising measures, including local, national, and international volunteers, community groups, and NGOs, as well as actors from the emergency response, planning and development sectors. This can include organising workshops or holding regular meetings.
- A **headquarter or communication hub shall be established as a single-point-of contact for information** about the stabilising effort. Information about the location, purpose and operational procedures of this headquarter (or communication hub) shall be made available to the population, visitors, and other relevant actors before, during, and after the disaster.
- **Stabilising measures shall be prioritised based on the post-disaster needs assessment** done in previous steps, especially step 8. The prioritisation shall take into account human health, living conditions of residents, and the safety of the population before buildings and immaterial objects.
- The **stabilising measures shall be kept updated in accordance with relevant local, national, and international guidelines, regulations, and decrees** (e.g. on the safe storage of movable heritage). The measures shall include, for example, the retrieval and storage of movable heritage, the stabilisation of immovable heritage, as well as the re-establishment of the functioning of sensors for monitoring the conditions of heritage assets.
- **Stabilising measures shall take into account the specific needs of vulnerable groups**, for example people in need of full-time access to electricity due to medical equipment requirements. These measures shall also cover other primary resource needs, like food and water.
- The **stabilising measures shall also cover the re-creation of community spaces** to provide the population with a sense of place and belonging.
- The resilience team shall **manage and control visitors that come for the disaster**, so that they do not impede the stabilisation effort and do not get in danger.
- The **necessary temporary/transitional activities shall be organised to bridge the gap between immediate emergency response, stabilising the situation, and starting the rebuilding efforts**. This might include setting up temporary housing, providing locations for food banks and schools,

903 providing temporary hospitals, mortuaries and information centres on missing relatives, as well as
904 supporting these necessary activities according to their priority. This priority should be decided
905 together with the local communities.

906 – **Stabilising measures shall also include medical and mental health support** to those in need, as
907 well as financial and insurance support to the impact population.

908 – At the end of the stabilising phase, the resilience team should **take account of the available**
909 **resources** (in terms of personnel, budget, materials, equipment, etc.).

910 ### 8.2.3 Recommendations

911 This subclause provides recommendations on how to fulfil this step of the DRM/CCA Framework.

912 – The **effects that these stabilising measures might have, should be assessed in detail**, also when
913 it comes specifically to vulnerable population groups, their needs and special requirements when it
914 comes to emergency response and disaster preparedness.

915 – The **local community should be involved in this step to raise the acceptance** of the measures and
916 compliance with existing local traditions and habits.

917 – **Actions carried out during the stabilisation phase should balance safety considerations**, the
918 need to maintain heritage values, authenticity, and integrity, and the needs of community groups and
919 local population.

920 – The **timing of stabilisation measures should take into consideration**, amongst others; a) the
921 nature and scale of the disaster, b) access to the affected area, c) the scale of the damages (see step
922 8), d) the significance of heritage assets, and e) the available (local) capacity.

923 – **Stabilising measures should be coordinated in such a way that they do not impede each other**
924 and the following recovery process. In addition, the stabilising measures should make sure that
925 infrastructure is safe and potentially damaged infrastructure (e.g. damaged water or gas pipes or
926 electric cables) don't pose subsequent risks and are secured.

927 – The resilience team should **set up a publicly available inventory of (movable) heritage assets** –
928 ideally before the disaster – that can be used during the emergency and stabilising phase to
929 communicate, e.g. by informing about damage levels and priority for action.

930 – The resilience team should **set up a platform where relevant guidelines and indicators can be**
931 **reached at any moment by everybody**. This should be linked to the inventory of heritage assets.

932 – The resilience team should **create (or make accessible) guidelines on how to deal with "disaster**
933 **tourists"**, taking into account the requirements and needs of the local authorities and communities.

934 – Prioritisation of **stabilising measures for heritage assets should also take into account**
935 **budgetary constraints**.

936 – The resilience team should **make use of satellite and geo-information services for monitoring**
937 **the stabilising efforts**.

938 – **Whenever possible, stabilising measures shall be designed in such a way that they allow access**
939 **to heritage assets for the population groups** (e.g. storage depots that allow access to stored
940 movable heritage).

941 ### 8.2.4 Supporting materials and tools

942 This subclause provides a selection of supporting tools and materials useful for the current step of the
943 DRM/CCA Framework.

EU, national, and international regulations directly related to communities and historic area as well as to other topics (e.g. chemicals) should be regularly consulted by the resilience team.

The **Copernicus EMS on Demand Mapping** provides on-demand detailed information for selected emergency situations that arise from natural or man-made disasters anywhere in the world.

8.3 Recover and building back better

8.3.1 General information

In this sub-clause, the final step of the DRM/CCA Framework is described, in particular the recovery and rehabilitation measures that need to be implemented, including revisiting steps 1-6 to update the results of these steps based on the new situation in the community and historic area. This is also a good opportunity to include climate change adaptation actions in the rebuilding effort in order to build back better. However, all these measures need to take the needs of the local communities and – potentially – also the heritage management needs into account to ensure that the community and historic area is rebuild in alignment with local customs.

8.3.2 Requirements

This subclause provides requirements on how to fulfil step 10 of the DRM/CCA Framework.

- In this step, **recovery and building back better measures shall be selected and implemented**. Ideally some measures have been pre-selected in steps 3-4. The final selection shall be based on an updated risk assessment (informed by the damage and needs assessment) and an updated identification and assessment process.
- The **selection of rebuilding and recovery measures shall also include impact assessments**, e.g. what effects recovery measure have in term of climate change adaptation and mitigation.
- **Financing and funding measures shall be identified** in order to fund the recovery and rebuild process. Co-funding and crowd-funding measures are to be considered. This might include setting up accounts/services to receive and distribute funding to relevant organisations and affected people.
- As part of the identification of financing and funding measures, it shall be **assessed for which rebuilding and recovery efforts public funding will be used** and for which private funding might be (more) suitable.
- **Institutional arrangements shall be updated**, including international NGOs supporting the rebuilding effort. In case external agencies are involved in the rebuilding effort it is paramount to include the local community in this process and ensure that their wishes and needs drive the rebuilding process. Otherwise, the risk is high that the historic area might be rebuilt in a way that is non-compliant with local custom.
- The resilience team shall **identify potential areas which should be abandoned due to damage beyond repair or high risks in subsequent events**. At the same time, the resilience team shall reiterate the importance of heritage to developers and (international) organisations involved in the rebuilding effort to avoid demolition (instead of restoration) of heritage due to economic concerns.
- The resilience team shall **coordinate with regional, national, and international organisations as well as local service providers** to implement new resilience strategies or changes to existing policies in order to avoid future damages and raise the resilience of the historic area in the long term.
- The resilience team shall **use this step to update the baseline information gathered in step 1** with new and up-to-date information. This also includes updates to the risk and resilience assessments, as well as the potential resilience building measures, based on post-disaster information.

8.3.3 Recommendations

This subclause provides recommendations on how to fulfil step 10 of the DRM/CCA Framework.

- Constant **communication with local communities and between all actors involved** in the rebuilding effort should be continuously ensured.
- The resilience team should **identify which changes in the social, economic, cultural, political, and environmental elements of the community and historic area have occurred due to the disaster**. This includes, for example, taking into account post-disaster changes to the composition of the inhabitants mix within and around the historic area and the subsequent emergence of new local communities.
- **Explanatory panels and other awareness and communication materials** explaining the disaster and its consequences should be installed in the community and historic area.
- It might be necessary to **mediate conflicting opinions on the value of historic areas for different local communities** amid political and identity tensions as reconstruction can also trigger conflict when one community/authority might claim their historic area and reject that of other communities.
- The resilience team should **be aware of traditional gender stereotypes and the differentiated** needs of men, women, minority groups, and other disproportionately affected population groups.
- The resilience team should **make special efforts to include women, minorities, and other disproportionately affected population groups** (and their skills, knowledge, etc.) in the rebuilding effort.
- The resilience team should **be aware that people benefiting from recovery projects have a vested interested in the continuation of these projects** and might be less inclined to criticize them or discuss problems.
- When deciding on rebuilding activities, the resilience team should **address conflicts between heritage building methods and modern building requirements** (e.g. energy efficiency). Here, it is important to take into account criteria that are compatible with heritage and local traditions (e.g. use of local materials as a means to implement measures with lower carbon footprint).
- After the rebuilding and recovery efforts have finished, the resilience team should **draw up and publish a public report**, analysing and detailing the disaster response and showing avenues for further improvement.
- During the rebuilding effort, **temporary activities** – potentially already started during the stabilising step – to provide necessary services and relief need to be set-up or continued. This includes food banks, schools, medical services, but also cultural traditions that provide a sense of normalcy and sense of place (e.g. markets, festivities).
- At the end of this step, the **results of steps 1-6 should be updated**, specifically the following ones:
    - Step 10.1: Identifying and evaluating, if any information and characteristics of the historic area and associated people and assets changed.
    - Step 10.2: Updating the risk and vulnerability assessment based on damage and needs assessment.
    - Step 10.3: Updating risk prevention/mitigation, climate change adaptation and emergency response options.
    - Step 10.4: If needed, reassessing and revising measures and procedures.

- Step 10.5: If needed, implementing (newly) selected measures and preparing updated emergency responses.
- Step 10.6: Revising and updating monitoring, evaluation, and learning procedures, including monitoring and evaluation of rebuilding and rehabilitation processes and measures. This step includes evaluating the actions taken during the whole emergency operating phase.

8.3.4 Supporting materials and tools

This subclause provides a selection of supporting tools and materials useful for the current step of the DRM/CCA Framework.

The **CURE Framework from UNESCO and the World Bank** [10] emphasizes that effective city reconstruction and recovery programs require that culture be mainstreamed across the damage and needs assessments, as well as in policy and strategy setting, financing, and implementation.

The **Parliamentary Protocol for Disaster Risk Reduction and Climate Change Adaptation** (UNDRR) seeks to guide parliamentary work to meet national disaster risk reduction and climate change adaptation needs. It also seeks to support the legislative branch's contributions to the implementation of the Sendai Framework and provide tools for parliaments to use in helping to strengthen resilience and adaptive capacity to climate change.

The **Copernicus EMS on Demand Mapping** provides on-demand detailed information for selected emergency situations that arise from natural or man-made disasters anywhere in the world.

For nearly all steps of the DRM/CCA Framework specific guidelines already exist that can (and should) be consulted to get a deeper understanding of and find best practices for these steps. In addition, several locally specific arrangements and responsibilities on different governance levels will exist that need to be taken into account when planning and conducting the different steps.

After conclusion of step 10 – and if no additional disaster strikes – the resilience management process should resume its normal operating phase, i.e. start a new cycle at step 1 at a regular time interval to maintain and improve the resilience and adapt to newly occurring external events and/or changing circumstances.

Annex A

(normative)

Template to characterise historic areas

Description of the element and examples	Characterisation of the historic area (to be filled out by end user)
Ecological subsystem elements	
Built & natural environment	
Describe the works of human, nature, and combined works of nature and man that belong to the historic area. These environments provide the setting in which all living and non-living things exist. They can range in scale from monuments, buildings and parks or green spaces to neighbourhoods, cities, or even multiple regions. **These environments may include:** - archaeological prehistoric sites - tombs, caves, sacred places, temples, burial sites; - streets, squares, markets, parks and gardens (both historic and contemporary) - castles, theatres, churches, cathedrals, city halls, residential buildings, businesses, shopping centres, and parking areas (also potentially historic and contemporary) - unmovable structures like frescoes, mosaics, pavements, fountains, obelisks, fortifications, and town walls - forests, trees, botanical gardens, grasslands, agricultural landscapes, mining landscapes, cultural landscapes, rivers, channels, lakes, and wetlands - animals	
Supporting infrastructures & services (physical)	

Describe the (public and private) supporting infrastructure and services that are necessary for the functioning of the historic area. **These infrastructures and services may include:** - energy and gas infrastructure - water infrastructure, including drinking water, drainage and sewage systems - transportation networks, including railways, roads, and waterways - communication infrastructure - health, education and other social infrastructure, including community centres, social housing, case and fostering infrastructure - emergency management and other public service infrastructure, like fire and police stations	
Moveable heritage	
Describe the movable heritage in the historic area. **This may include:** - pictures, paintings and drawings - manuscripts, books, documents and publications - statuary art and sculptures - archaeological materials and finds, including bones, textiles, pottery, ceramics - tables, stalls, benches, carousels - musical instruments	
Socio-cultural context (intangible heritage features)	
Describe the social and cultural elements of the historic area. These include the communities of people living and/or working in the historic area, as well as people using the historic area for recreation or touristic activities. It also includes the spiritual, material, intellectual and emotional features of society or the relevant social groups, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs. For these elements special attention should be paid to (and ensure the meaningful inclusion of) vulnerable population groups and groups disproportionately affected by disasters, including non-native speakers, children and adolescents, the elderly, people with disabilities, immigrants, women, people with lower educational degrees, people residing in areas of high poverty, and the unemployed. **These elements may include:**	

- population groups, including residents, commuters and workers, tourists, volunteers - traditional groups, communities, and other community organizations, like Indigenous people, local interest groups and associations, and friends of heritage groups - social practices, norms, and behaviours, like social networks that facilitate cooperation, community involvement in decision making, and everyday practices - cultural and traditional practices, knowledge, and skills, including traditional craftsmanship, vernacular architecture, crafts and traditional agricultural techniques, traditional healing systems, traditional ecological wisdom, other traditional resilient behaviours, and gastronomy - rituals, events, and arts, like festivals, religious rituals, ceremonies, theatre, music, dances, and storytelling - oral traditions and expressions, like proverbs, poems, tales, legends, dialects, folklore, and songs	
Economic context	
Describe the (public and private) economic elements of the historic area, i.e. the elements of production, distribution, trade, as well as consumption of goods and services. **These elements may include:** - tourism - agriculture - animal husbandry - production and other services - night-time economy and entertainment	
Political context / Governance	

Describe the government elements of the historic area and its policy context, i.e. the set of codified principles and institutions that guide, compel, or prohibit actions of members of the society. **These elements may include (non-exhaustive list):** - official regulations, plans, and standards, like spatial plans, disaster risk management plans, climate change adaptation plans, emergency plans, building codes, and conservation regulations - institutions and institutional arrangements, like government facilities and offices, property owners, and other management facilities or authorities	
Function & use	
Describe how the historic area is used by people and which function it provides to them and its surroundings. **This may include:** - touristic use - work & housing - recreation - food - artistic & cultural use	
Risk information	
Describe the different factors that might put the historic area at risk, including the hazard(s) that the different elements of the historic area might face, which elements might be exposed to which hazards, what makes these exposed elements vulnerable to the specified hazards (including sensitivity and capacity), and which potential impacts might result from this.	
Hazard(s) **Hazards might include:** - geophysical hazards, like earthquakes, mass movements, or volcanic activity - climate-related hazards, like extreme precipitation, extreme temperatures, drought and water scarcity, fluvial and pluvial flooding, severe wind, sea-level rise, ocean acidification, pollution, or wildfires - biological hazards like, viruses, bacteria, fungi, vegetal or animal action - human-induced hazards, like land-use change or misuse, pollution, accidents, terrorism, armed conflicts, wilful damage, and cyber-attacks These hazards can cause further cascading hazards, like tsunamis, faulting, lava flows, lightning, heatwaves, changes in wet/dry cycles, salt intrusion, wave impact, pandemics, root wedging, acid rain, industrial accidents, or explosions.	

Exposed elements Exposed elements relate to the elements present in the historic area that may suffer impacts (direct and indirect) as a result from a specific (combination of) hazard(s). These will include the elements described in the previous sections of this template.	
Vulnerability Vulnerability describes the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts including sensitivity or susceptibility to harm and lack of capacity to cope and adapt. In short: What are the factors that make the elements more or less susceptible to the impacts of specific hazards?	
Impacts Impacts are the effects the occurrence of one (or multiple) hazard(s) have on natural and human systems. Impacts generally refer to effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services and infrastructure due to the interaction of hazardous events occurring within a specific time period and the vulnerability of an exposed society or system. **Impacts can be** - physical (e.g. damage to buildings) - societal (e.g. injuries of humans) - functional (e.g. loss of access to or disruption of services) - economic (e.g. loss of revenue) - intangible (e.g. loss of heritage value)	

Annex B

(informative)

Potential indicators per step of the DRM/CCA Framework

Step 1 – Prepare the ground

- Percentage of city land area covered by tree canopy [ISO 37123:2019, indicator 8.8]
- Annual expenditure on upgrades and maintenance of city service assets as a percentage of total city budget [ISO 37123:2019, indicator 9.1]
- Annual expenditure on upgrades and maintenance of storm water infrastructure as a percentage of total city budget [ISO 37123:2019, indicator 9.2]
- Number of different electricity sources providing at least 5 % of total energy supply capacity [ISO 37123:2019, indicator 7.1]
- Percentage of city surface area covered with high-albedo materials contributing to the mitigation of urban heat islands [ISO 37123:2019, indicator 8.9]

Step 2 – Assess vulnerabilities of the exposed elements and risks

- Annual frequency of extreme rainfall events [ISO 37123:2019, indicator 8.4]
- Annual frequency of extreme heat events [ISO 37123:2019, indicator 8.5]
- Annual frequency of extreme cold events [ISO 37123:2019, indicator 8.6]
- Annual frequency of flood events [ISO 37123:2019, indicator 8.7]
- Magnitude of urban heat island effects (atmospheric) [ISO 37123:2019, indicator 8.1]
- Number of risk scenarios identified per year for the most prioritized hazards and respective mitigation options for each hazard / risk scenario
- Vulnerable population as a percentage of city population [ISO 37123:2019, indicator 13.1]
- Historical disaster losses as a percentage of city product [ISO 37123:2019, indicator 5.1]
- Average annual disaster loss as a percentage of city product [ISO 37123:2019, indicator 5.2]
- Educational disruption [ISO 37123:2019, indicator 6.4]

Step 3 – Identify resilience measures

- Number of workshops organised per year with relevant stakeholders for the historic area and the community, engaged in prevention, mitigation, adaptation and emergency response processes
- Number and type of stakeholders groups involved in the process of identifying resilience measures (over time)
- Number and type of identified measures per hazard
- Number of identified measures that may be identified best practices for resilience of historic areas

Step 4 – Assess and select resilience measures

- Time, financing and skills available
- Long-term effect vs. short-term benefit
- Resilience metrics

- Level of effectiveness of measures
- Percentage of natural areas within the city that have undergone ecological evaluation for their protective services [ISO 37123:2019, indicator 8.2]

Step 5 – Implement selected resilience measures and prepare emergency responses

- Implementation readiness of measures
- Amount of measures implemented
- Percentage of schools that teach emergency preparedness and disaster risk reduction [ISO 37123:2019, indicator 6.1]
- Percentage of population trained in emergency preparedness and disaster risk reduction [ISO 37123:2019, indicator 6.2]
- Percentage of emergency preparedness publications provided in alternative languages [ISO 37123:2019, indicator 6.3]
- Annual expenditure on emergency management planning as a percentage of total city budget [ISO 37123:2019, indicator 9.5]
- Percentage of critical facilities served by off-grid energy services [ISO 37123:2019, indicator 7.3]
- Territory undergoing ecosystem restoration as a percentage of total city area [ISO 37123:2019, indicator 8.3]

Step 6 – Establish resilience monitoring, evaluation and learning processes

- Frequency of DRM/CCA Framework monitoring
- Progress assessment of the DRM/CCA Framework and achievements of the scheduled objectives
- Frequency of meetings to inform the decision-makers and the local communities
- Number of communication channels in use/all communication channels in the city
- Human resources required in the process (comparison plan vs. remaining)
- Percentage used budget in relation to the planned budget
- Learning outcomes as score for knowledge about risks (quiz)
- Transformation level of aesthetic values

Step 7 – Conduct emergency response procedures

- Percentage of emergency responders who have received disaster response training [ISO 37123:2019, indicator 15.2]
- Percentage of local hazard warnings by national agencies annually that are received in a timely fashion by city [ISO 37123:2019, indicator 15.3]
- Percentage of emergency responders in the city equipped with specialised communication technologies able to operate reliably during a disaster event [ISO 37123:2019, indicator 18.1]

Step 8 – Assess needs and impacts

- Number of residential properties flooded after a natural disaster as a percentage of total residential properties in the city [modified ISO 37123:2019, indicator 12.5]
- Percentage of the city population directly affected by a natural disaster [modified ISO 37123:2019, indicator 13.5]

- Number of critical infrastructures flooded after a natural disaster as a percentage of critical infrastructure in the city [modified ISO 37123:2019, indicator 21.5]
- Number of active and temporary waste management sites available for debris and rubble per square kilometre [ISO 37123:2019, indicator 16.1]

Step 9 – Stabilise situation

- Number of community organisations involved in the stabilizing phase
- Number or percentage of adequate storing facilities as compared to needs (e.g. suitable climatic conditions, suitable access, etc.)
- Number of insured infrastructure and housing
- Percentage of properties with insurance coverage for high-risk hazards [ISO 37123:2019, ind. 5.3]
- Percentage of total insured value to total value at risk within the city [ISO 37123:2019, ind. 5.4]
- Percentage of artworks and movable heritage assets that were recovered
- Percentage of structures and infrastructures that were covered by stabilising measures
- Number or percentage of population that have been relocated long-term (longer than a few weeks)
- Percentage of essential services functioning

Step 10 – Recover and building back better

- Number of institutions, community organisations, etc. involved in the rebuilding effort
- Percentage of population engaged in volunteering activities
- Number of different communication channels used to involve / inform relevant stakeholder groups
- Frequency of updates/revisions to the recovery and rebuilding strategies and plans
- Percentage of housing stock, infrastructure, and other built environment that are targeted with retrofitting / resilience building measures
- (projected) duration of the recovery and rebuilding efforts
- Post-rebuilding economic performance (compared to pre-disaster state)
- Duration of displacement and spatial distribution of displaced population
- Percentage of original inhabitants that return after the rebuilding effort
- Allocation of disaster reserve funds as a percentage of total city budget [ISO 37123:2019, ind. 9.7]
- Percentage of damaged infrastructure that was “built back better” after a disaster [ISO 37123:2019, indicator 12.4]

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