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ROADMAP

Shared basic elements for a 'European Doctrine on Disaster Risk and Crisis Management'

Vision Paper

ROADMAP

Shared basic elements for a ‘European Doctrine on Disaster Risk and Crisis Management’

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PART I - Main document

Foreword

ROADMAP (European observatory on disaster risk and crisis management best practices) is a project funded by the European Union (EU) under the UCPM-2020-KN-AG call (ref. GA 101017776). The project has been carried out by a partnership of highly specialised institutions from Italy (The Consortium Italian Centre for Risk Reduction and the Italian Civil Protection Department), Norway (University of Stavanger) and Portugal (Association for the Development of Industrial Aerodynamics).

The main goal of the project is to contribute to establishing the foundations or baselines of a European "Doctrine on disaster risk and crisis management" funded on the cooperation of scientific/academic communities and disaster risk management (DRM) authorities. In this light, ROADMAP contributes to increase access to information on DRM and disaster risk reduction (DRR) by systematically collecting, reviewing, and analysing past and ongoing experiences. The goal is to identify Good Practices (GPs), successful stories and lessons learnt, and make them readily available and usable to the communities and practitioners interested and active in DRM and DRR fields to further increase the understanding of DRM solutions, in compliance with the United Nations' Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR, 2015). A continuous interaction between the ROADMAP Consortium, the DG-ECHO and the JRC have been pursued to achieve the project goal.

Outcomes of the project (see Part II) have been organised in a web platform (the Solutions Explorer), where a number of GPs are present, and disseminated through periodical bulletins, webinars and three thematic papers focusing each on a selected relevant topic. Moreover, the project was supported by an Advisory Group (AG) of selected scientific/academic experts and decision-makers in the field of DRR and DRM. Invited speakers from the AG and from outside the project also contributed to the webinars.

This vision paper for DG-ECHO is the final step of the project, since, according to the project description, "The vision paper, elaborating and systematizing the findings from thematic papers, shall put the baselines for the creation of a shared European 'Doctrine on disaster risk and crisis management', also evidencing the research needs and possible actions to promote".

Based on the experience gained in the development of the project and the interaction with the AG, this paper aims in particular to frame the activities aimed at building a European DRM doctrine in a longer-term perspective.

On the one hand, what has been achieved so far represents a blueprint, the realisation of which still requires some steps to be taken. Therefore, a roadmap is proposed, which needs a further 18-24 months, and whose realisation should lead to a regular release of the products and services developed in ROADMAP.

On the other hand, as envisaged by the project, this document is also intended to provide DG-ECHO with recommendations on possible longer-term initiatives, which would enable the full development of a DRM doctrine within the KN.

The overarching goal is that the work done by the ROADMAP partners will help in the KN-related activities that DG-ECHO and JRC are planning and implementing.

1. Toward a european doctrine on disaster risk and crisis management

1.1 Definition

The content of the ROADMAP project stems from the concrete experience of those who work in the field of civil protection and have to make decisions every day, establish actions and procedures, and identify priorities for the management of disaster risk. This happens at local, national, European and international levels, and concerns not only the management of crises and emergencies, but the whole DRM cycle (understood here as comprising prevention, preparedness, crisis and emergency management, and post-emergency/recovery). These decision-making activities, although characterised by specific elements, are often the response to similar situations and challenges. Therefore, there is a need for a common and shared understanding of the different cases that may occur and of the solutions already identified by others and successfully adopted. They may represent GPs that decision-makers can refer to when making their choices.

The characterisation of specific situations to be addressed in the DRM cycle and the identification of possible solutions can benefit significantly from a solid scientific knowledge basis. Therefore, not only the civil protection decision-makers are relevant, but also the scientific/academic community that holds the know-how in this field. The establishment of a shared understanding, to which all the stakeholders within the civil protection field can contribute through a bottom-up approach, is what ROADMAP calls doctrine, as defined in the ROADMAP description: "doctrine is intended as a shared understanding of disaster management between decision-makers and scientific actors". Thus, this vision paper provides a shared understanding between two communities: civil protection decision-makers and scientists/academics.

1.2 Why and for whom

1.2.1 Rationale and motivation

Europe, through the EU Civil Protection Mechanism (UCPM), is moving towards a shared approach to DRM and crisis management. This approach implies a common vision of reference values, objectives to be achieved and implementation methods, and a coordination of activities carried out at different territorial levels of governance while respecting the differences and autonomies of the various local, national and European civil protection authorities.

This approach is particularly important in order to better manage risks and crises that affect several countries at the same time, and especially to prevent and be prepared for possible multi-risk disasters. The multi-risk context includes both the concurrence of different and independent risks that affect the same area in the same period of time (whatever the size of the area and the time window considered), and that they may be connected to each other through a cascading effect. The COVID-19 pandemic, together with the other civil protection emergencies that have occurred in the last two years, represents the most recent and severe example of concurrent risk management on a European and global scale (Dzigbede et al., 2020; Ishiwatari et al., 2020; Capone et al., 2022; Petrenj et al., 2022; UNDRR and UNU-EHS, 2022).

The evolution of the UCPM has shown that, despite the national differences, common traits and approaches can be highlighted among all Participating States. This emerges from the operational experiences and lessons learned identified at both national and European level.

From a theoretical point of view, one could speculate at length on how to conceptually develop this doctrine, but the development of the current UCPM over the past 20 years shows that the Mechanism is based first and foremost on training and sharing experiences, cooperation and mutual aid, implementation of exercises and courses; in short on sharing of GPs and lessons learnt, resulting from the concrete experiences of those working in the field of civil protection.

The evolution of this constant exchange of views is embodied in the establishment of the amended EU Civil Protection Knowledge Network by Decision 1313/2013/EU. The Knowledge Network (KN) is a place supporting the above collaborative approach, both conceptual and physical (although virtual), where civil protection practitioners and stakeholders can find, share and comment their experiences and GPs. This is the place where a civil protection doctrine can be built and nurtured by all stakeholders through shared understanding of DRM.

The results achieved in 20 years by the UCPM are impressive; today, civil protection authorities from 33 countries share language and understanding on most of the DRM concepts. In order to create a real and long-lasting community in this field, it is extremely important to continue to develop common theoretical bases, not only from a technical point of view but also from the different operational approaches.

[1] For this and other definitions, please refer to the Glossary at the end of this thematic paper.

In addition, the UCPM has become an important stakeholder in the field of DRM at an international level and, in order to remain relevant and effective, it is crucial to ensure that it continues to develop its actions based on solid and shared theoretical foundations.

1.2.2 Potential beneficiaries of the doctrine

The two communities that have contributed to define this shared understanding, i.e., scientists/academics and civil protection decision-makers, are clearly the main beneficiaries of the work carried out, along with the so-called "hybrid experts", civil servants with a sound experience in both science and public administration, who act as an interface between them (Dolce and Di Bucci, 2022).

On the one hand, civil protection decision-makers at any level, from local to national to European and international, can develop strategies, joint actions, and collaborations. These can start from a knowledge basis, pooled and supported by shared GPs, as they have been implemented and resulted, at least on one occasion, effective. These activities include scientific knowledge from different disciplines to support the decision-making process.

On the other hand, scientists/academics who work on research topics of potential or recognised interest for civil protection, can find ideas and inspiration in this shared understanding, in order to capture the potential research areas to be explored as well as to better finalize their studies in view of their application in the civil protection field. In addition, they can benefit from a broader picture of the different areas and ways of cooperating with existing civil protection authorities at various scales and can envisage retracing or developing similar experiences in their own field of expertise.

There are also other potential beneficiaries of this shared understanding, once it is made available through a system such as the KN. These are the other actors who play important roles in the DRM, e.g., the technical community of professionals, the mass media, the judiciary, and even citizens (Dolce and Di Bucci, 2014). All of them can, in principle, find GPs of their interest and, more importantly, be part of the process and help developing the shared doctrine.

Nonetheless, some challenges need to be taken into account. Firstly, scientists/academics and civil protection decision-makers do not share a common language yet. In some European countries, these two communities have a relatively long experience of working together and have reached a good level of understanding, in some others this is still developing (e.g., De Groeve and Casajus Valles, 2015). Secondly, the sharing of a common vision of values and objectives is still to be achieved, despite of the guiding principles of the EU.

The ROADMAP proposed doctrine is a first step to overcome these challenges. However, a great deal of joint work is still needed to reach a shared understanding of DRM and crisis management that is consistently implemented by all the actors involved.

2. A future perspective

In the light of what has just been written, we might ask ourselves whether we have achieved the goal of building a shared understanding of DRM among decision-makers and scientific actors, and whether what we have achieved can be regarded as a doctrine.

Taking into account the complexity related to the variety of stakeholders involved and the coexistence of concurrent legal frameworks, we think that there is a long way to go to build a shared understanding of DRM and crisis management, and that there is the need for a joint effort by all participants in the process, following a bidirectional approach, top-down and bottom-up. Nevertheless, we are confident that we have mapped out an adequate path to this goal and have already taken the first steps towards it.

We consider the approach adopted and the strategy designed as a strength of the work done, because, on the one hand, they are based on a shared general vision of the DRM and, on the other hand, they focus on very practical solutions and ideas coming from the whole community involved in the process.

The main limitation, in our view, is in the complexity of the process itself, which needs time and guidance in order not to miss the target. This nature of the process, in turn, would benefit from a more structured and robust organisation to effectively manage the collection, sharing and "maintenance" of ideas and GPs, which, over time, might no longer be new or even be overtaken by new practices or changing needs.

The goal, for us, remains the carrying out of a continuous work to make the doctrine more complete, "useful, usable and used" (Aitsi-Selmi et al., 2016). Below, we present the steps that, in our opinion, still need to be taken having this in mind, together with some recommendations that we make to DG-ECHO to optimise, in our view, the results of the work carried out.

2.1 A "roadmap" for moving ahead

The present endeavour aims at drafting a roadmap on how the collaborative process developed over these 18 months should be structured to continue after the end of the project.

We believe that the ultimate goal of the activities developed in this project is the future release of the products developed as a regular service within the KN. These products consist of regular bulletins, thematic papers published from time to time, a Solutions Explorer continuously updated and consulted (see PART II). These products will be supported by a panel of experts and a forum allowing easy interaction between stakeholders and end-users. All these are the building blocks that form the common house of civil protection decision-makers and scientists/academics to start with, which will include other stakeholders in its development.

After the end of this project, however, a number of steps will still be necessary to achieve this final goal. They should

represent the transformation of the project results into pre-operational tools for DG-ECHO, in particular for the KN, and the UCPM Participating States. These steps include the development of the following issues, on which the ROADMAP partners are willing to contribute and work synergically with DG-ECHO and JRC, if requested.

- A more effective organisation of the AG's activities. In some cases, it was not easy for the project to formulate requests in such a way that the AG could best provide its expert advice. In addition, in some cases, it was difficult to keep up the involvement of individual experts, both scientists/academics and decision-makers, throughout the project. These issues need to be analysed and resolved if the AG is to become a permanent structure serving the KN.·
- The involvement of other actors that are part of the DRM community deserves dedicated attention and consideration as a further step in the work, through a sharper focus on which type of expertise is needed and for which purpose.
- The design and development of a dedicated bulletin writing area within the KN. In the project, this activity included the search and selection of GPs to be described in each bulletin but, in the future, the same GPs can be transferred into the Solutions Explorer database, which is the GPs repository. Bulletins will serve as a canvas where to register most recent GPs which will become part of the Solutions Explorer. The spread of information could also take advantage from translation in multiple languages and direct distribution to the interested communities.
- The development of an editorial project for the regular publication of thematic papers on topics of interest. Support for this activity could be provided by the JRC, together with the AG.
- The full implementation of the Solutions Explorer in the KN platform. This activity requires close cooperation with DG-ECHO, both with regard to the final aims and design of this tool, including guidelines on the contents and on how to identify, select and evaluate good practices using ad hoc indicators, and with regards to ICT issues.

All these upgrades of the final ROADMAP products could be developed in 18-24 months.

2.2 Recommendations

Based on the work done, some recommendations can be outlined for DG-ECHO. They have been conceived as starting points for reasoning on the possible development of the doctrine within the European Union Civil Protection KN. These recommendations are summarised in a schematic list but must be seen as a system of interlinked activities that need to be carried out in a synergic and integrated manner, in order to achieve the goal of building a doctrine that is considered by the entire community a shared understanding of DRM.

2.2.1 Importance of an integrated community of experts

The support of a community of experts which includes both civil protection decision-makers and scientists/academics has proved to be effective in building a shared understanding of disaster risk and crisis management. The KN could benefit from the ROADMAP AG as a first nucleus to develop a wider community of experts, using the selection criteria set up by the project.

With regards to the scientists/academics, the expert group should cover fields of expertise including data collection, instrumental monitoring, forecast, modelling, scenarios, hazard, physical vulnerability, social vulnerability, exposure and risk, as well as legal issues and communication. This expertise has to be referred to different risks organised in groups such as: geological, hydrological, meteo-climatological, biological and anthropogenic risks, including cascade effects. For the selection of civil protection decision-making experts, the expert group should cover different levels of governance, such as Municipality, Regional, Member State, European, International, etc. Field of expertise that should be covered include prevention (structural prevention), preparedness (non-structural prevention), response, recovery and "build back better", DRR and DRM communication (media and social media), national regulations and laws, ICT and logistics, education and training, use of European funds, etc. General constraints are a good balance in gender and geographical distribution. The gradual enlargement of this community implies an organisational effort to design and manage the active contribution of participants, an issue that needs to be addressed while the expert group is still being established.

2.2.2 Need of an EU observatory of good practices

A tool like the Solutions Explorer should be part of the KN and fed by civil protections and other interested parties. It could be the forum for interaction between stakeholders familiar with GPs. In other words, the Solutions Explorer could be the virtual place where the DRM doctrine, i.e., the shared understanding on DRM, is built following a bottom-up approach and managed following a top-down approach. It could represent a common reference point to both store and continuously look for GPs.

The experience of the collection of GPs (see bulletins in the References; Capone et al., 2022; Tagliacozzo et al., 2022a; Tagliacozzo et al., 2022b) clearly shows that those who design, implement, test and use these practices are best placed to make an initial assessment of their effectiveness and potential applicability to similar cases. Therefore, their involvement in populating a tool such as the Solutions Explorer is of great value in developing a shared DRM doctrine (see PART II).

2.2.3 National observatories

The implementation of similar approaches and tools for the collection and analysis of GPs should be promoted and supported in all EU Member and Participant States, also through the EU financing tools already in place (e.g.,

Prevention and Preparedness Projects in Civil Protection - Track 1). This would give a major boost to a widespread development of GPs collection.
The European and national levels could be integrated, in order to optimize the collection and consultation of GPs. The ROADMAP project has proposed one approach based on the Sendai Framework.
An experience at this level is being developed in Italy. In this country, the Civil Protection Code (Legislative Decree 1/2018) states that the Civil Protection Department performs tasks of national importance, such as guiding, promoting and coordinating the activities of central and peripheral State administrations, of the regions and local levels, and of public or private institutions and organisations, also through the activation of an observatory on good practices in civil protection activities.

2.2.4 Involvement of other participants in the construction of the doctrine

The project has made it possible to lay the foundations for the construction of a shared DRM doctrine, but there are still numerous aspects to be dealt with, e.g., the involvement of other actors: NGOs, media, industry, citizens, etc. DG-ECHO could encourage and steer these further developments through new calls in the same vein as that through which the ROADMAP project was funded.
On the one hand, it is necessary to set up parallel paths of involvement of these other actors in the doctrine-building process. On the other hand, it is necessary from the outset to have an overview of the necessary interactions between these participants and the best way to foster and benefit from the integration of these figures and competences, in order to develop a shared DRM understanding.

2.2.5 Development of research based on a multi-hazard risk approach

The in-depth studies conducted within the project highlighted the limited amount of research on the development of scenarios and risk models based on a multi-hazard risk approach. This area of research is clearly transdisciplinary, including both the scientific/academic expertise (STEM, economic and social sciences, law, communication, etc.) and the knowledge that decision-makers and civil society as a whole can provide. This can be partly pursued by DG-ECHO, by directing part of its research funding in this direction. But even more so we suggest that DG-ECHO encourages the various relevant Directorates-General of the European Commission to issue calls for the development of research projects on these specific topics. Among the possible topics one can mention the development of European and national multi-hazard risk models, the study of cascade effects and their cumulative impact, or the integration of the social vulnerability into multi-hazard risk analyses. The AG issued within the ROADMAP project could help in identifying and circumscribing some promising research areas in the field of multi-hazard risk.

2.2.6 A common high-level civil protection education and training

The High Education Institutions provide an invaluable service by training future researchers and professionals with a high degree of knowledge and specialization. These individuals will later work in the entire DRM cycle. Therefore, they should be trained to work as part of a team in a larger network. A common high-level education path for civil protection decision-makers and researchers, at national and EU levels, should be developed to guarantee some commonality in the syllabus and a shared understanding of the DRM doctrine, supported by research and innovation.
This activity would benefit from the identification of a shared vocabulary, the definition of a common background and the exchange of education and training experiences. Initiatives aimed at developing these objectives could be addressed, promoted and monitored within the KN, as far as possible in cooperation with the Member States, again following a bidirectional approach, bottom-up and top-down.

2.3 Final remarks

The synergic collaboration process between the ROADMAP consortium, the DG-ECHO and the JRC, has proven to work effectively and to aim at shared common goals. Moreover, the project partners consider the experience gained as an added value to their own competences and fields of knowledge. The ROADMAP consortium thanks DG-ECHO for the opportunity to work on these relevant topics and wishes that this fruitful collaborative process could continue after the end of the project.

PART II - Background document

As seen in PART I, the main goal of the project is to establish a European "Doctrine on disaster risk and crisis management" that, as defined in the ROADMAP description: "is intended as a shared understanding of disaster management between decision-makers and scientific actors". This activity has the present vision paper as the final product of the project. In the following sections, the methodology and results that brought to this paper are summarized along with some comments and examples. In particular, main specific suggestions are presented at the beginning of each subsection, followed by examples, comments, potential benefits and criticalities.

3. Methodology

3.1 Data collection

The shared understanding is based on selected experiences, GPs and solutions already implemented in the UCPM Member and Participating States, as well as in other countries outside Europe.
The research of GPs derives from an iterative process entailing two main steps: the extensive collection of DRR and DRM practices from diverse sources, and the screening of practices to single out the ones that can fit the research scope. To this end, a bidirectional approach has been adopted, namely (i) top-down, by selecting relevant topics in disaster risk and crisis management to find out GPs and solutions as well as the science-to-policy transfer, and (ii) bottom-up, by collecting such GPs, solutions and experiences to practically facilitate the daily job of civil protection decision-makers in the DRM field.
This bidirectional approach was supported by the advice and contribution of a network of experts: the AG (PART II subsection 5.2.), the speakers invited in the webinars (PART II section 4.2.), researchers hired for the writing of the thematic papers, as well as the ROADMAP partners and some young researchers involved in the project. This network of experts contributed to (i) selecting the relevant topics in a top-down approach, (ii) establishing a set of criteria to recognize GPs in DRM, (iii) setting a general bottom-up methodology to find out relevant experiences in DRM, (iv) collecting and systematizing the knowl-

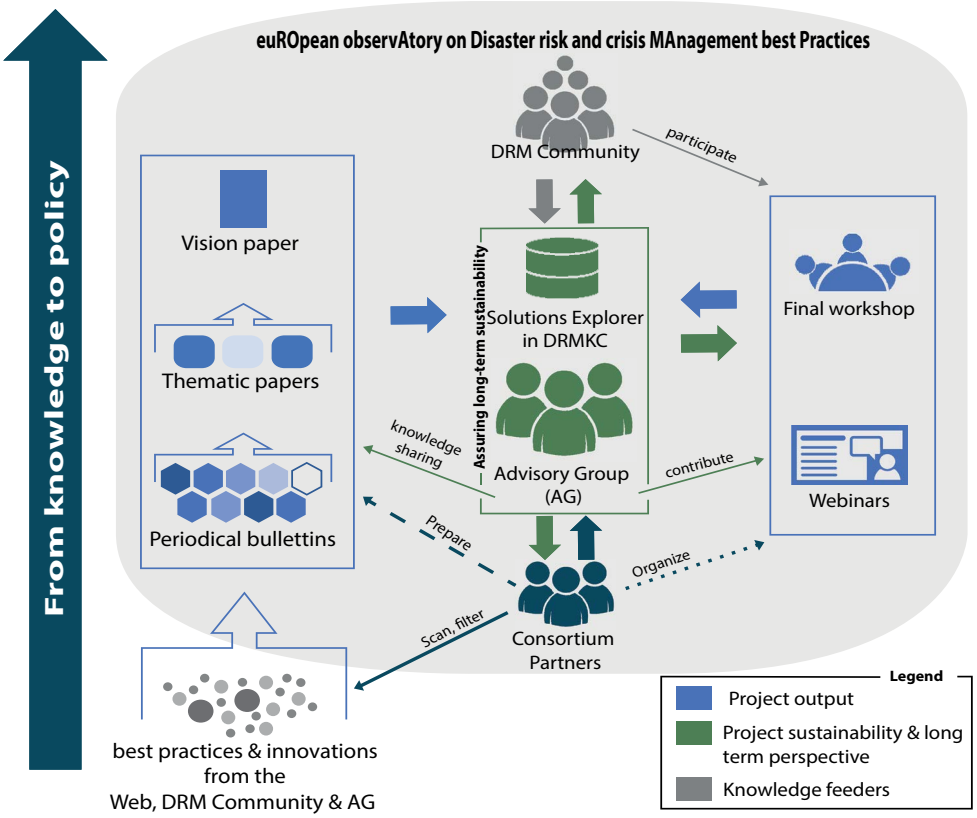


Figure 1: Bidirectional approach, top-down and bottom-up, adopted in this work.

edge in the various deliverables (bulletins and thematic papers), and (v) organizing the tools used to disseminate findings.

3.1.1 Deepening the top-down approach

To establish a methodology for identifying a shared understanding between scientists/academics and decision makers in DRM, a preliminary question had to be posed: which are the relevant topics for which a shared understanding is needed?

There are a number of issues and cross-cutting themes that may be recognized as being relevant in different phases of disaster risk and crisis management. As a reference, the significance and importance of certain research themes and actions is implicitly recognized in the specific challenges and gaps highlighted in the call for proposals launched in subsequent EU framework research programmes. For example, in Horizon 2020, the societal challenge chapter on 'Secure societies – Disaster Resilience' issued a number of calls for research proposals on several topics, including crisis management, disaster resilience and climate change, critical infrastructure protection, communication technologies and interoperability, ethical/societal dimension. Each of these topics is further declined according to specific societal challenges that are deemed important to be tackled to achieve concrete results to solve them. In addition, there are several international agreements and policy frameworks that can be usefully analysed to extract relevant topics to be further studied with the aim to build a shared understanding. For instance, as highlighted in the volume Science for Disaster Risk Management 2020 (Casajus et al., 2021), the international agreements and frameworks that have been in place since 2015 – the Sendai framework for DRR 2015-2030, the 2030 Agenda for Sustainable Development, the Paris Agreement and the 2016 Urban Agenda – recognize the risk anticipation and management as fundamental to reinforce the related policy areas. It is possible to aim at a coherent development of the different policy areas pertaining each of the frameworks. Indeed, several links between the Sendai Framework and the Sustainable Development Goals can be recognised, as UNDRR does indicate how the Sendai Framework can contribute to the achievement of the Sustainable Development Goals (UNDRR, 2016).

Table 1 reports a list of topics that were identified and considered at the beginning of the work for a deeper analysis. After fruitful discussions with the AG, the ROADMAP consortium decided to focus on GPs related to the topics marked with an asterisk *, which were collected and analysed in the context of real-life scenarios within three thematic papers (Capone et al., 2022; Tagliacozzo et al., 2022a; Tagliacozzo et al., 2022b). The expertise and background knowledge of the network of experts contributed to give useful indications, especially on how to improve the papers.

3.1.2 Deepening the bottom-up approach

For each thematic paper selected topic, but also for the bulletins, a bottom-up approach was applied to find relevant experiences and examples of practical solutions adopted by civil protection decision-makers and other actors in the DRM field to select and analyse GPs.

The bottom-up approach tackled specific websites dealing with the DRM field[1]. UN, EU and national governmental documents were retrieved from their respective websites, as well as documents provided by international (e.g., World Bank, FEMA, UNDRR, UNESCO, GFDRR), European (e.g., DG-ECHO) and national agencies (national civil protection authorities, environmental institutions, competent ministries, etc.). In the future, relevant experiences and effective solutions could be identified and presented directly by the authorities and organizations that implemented them.

In addition, other types of grey literature, such as factsheets, newsletters, reports, manuals and guidelines were gathered. Furthermore, up-to-date scientific publications were considered. Most prominent journals in risk analysis, multi-hazard and/or multi-risk practice, resilience, risk reduction, disaster management were examined (see APPENDIX A for the list of journals). This task also included searching publications through research databases (e.g., Science Direct), starting from the set of keywords shown in APPENDIX B. Scientific publications are, in general, useful to contextualize the topic at hand, although often we did not find many GPs, but mainly recommendations and suggestions. Nevertheless, they were an excellent starting point to learn about the state of the art on DRM and DRR. Several of the scientific publications stemmed from research projects addressing various aspects of DRM and civil protection, and contained recommendations prepared by government agencies worldwide. Finally, interactions with relevant actors in DRM field as well as knowledge transfer from the network of experts have been carried out.

All the knowledge and information gathered in the process described above was systematised, organised and published in periodical bulletins (PART II subsection 4.2.) and in three thematic papers, to inform about up-to-date relevant GPs and experiences that are worth reporting and transferring to the DRM and crisis management community.

The knowledge and expertise of the AG was relevant also in this approach, since the AG provided relevant examples of GPs and real-life scenarios where such practices were applied.

1 undrr.org; drmkc.jrc.ec.europa.eu; fema.gov; openknowledge.worldbank.org; preventionweb.net; gfdrr.org/en; unesdoc.unesco.org; unccd.int; oecd.org; jma.go.jp/jma/indexe.html; preparecenter.org; https://ec.europa.eu/echo/index_en

3.2 Outcomes of the bidirectional approach

The bidirectional approach, top-down and bottom-up, described above provided four main outcomes: periodical bulletins, thematic papers, webinars, along with this vision paper.

Short periodical **bulletins** (see in the References) summarise results from the accurate selection of the material gathered according to the process above. ROADMAP published eight bulletins, each focusing on a particular macro-theme, selected according to a multi-risk perspective and considering all the phases of DRM. Events with high impact and recent occurrence have been included and priority has been given to multi-hazard risk scenarios, featuring concurrent/cascading hazards. Each bulletin has a similar structure. After an initial introductory text that presents in each issue the ROADMAP project, the next part describes the context of the topic. Recommendations and GPs follow, and they are completed by concrete examples.

In order to ensure constant monitoring, as needed by is-

Theme	Topics to be analysed
Decision making in a multi-hazard risk context	Enhance prevention and/or preparedness in case of different hazards threatening the same area (e.g., flood and earthquake)
	Enhance preparedness in case of different hazards threatening the same type of assets (e.g., buildings that are prone to earthquakes but also to excessive energy consumption; or buildings that are prone to earthquakes and to flooding)
	Enhance prevention and/or preparedness in case of cascading effects
	Prepare for an efficient response in case of multiple hazards hitting contemporarily in the same region
	CCA: Enhance prevention and/or preparedness in case of climate-related hazards (e.g., windstorms, floods, sea level rise, extreme weather events, droughts, forest fires etc.) also taking into account possible cascading effects (e.g., droughts and forest fires)
	* Enhance DRM in all phases - prevent, prepare and organize response - in case of hazard hitting during a pandemic like COVID-19
Horizontal themes (socio economics, judiciary, communication)	Judiciary systems in DRM: Comparison of laws and responsibility chains in different countries
	Strategies to evaluate and reduce the systemic risk: accounting for economic and social factors in the assessment of mid to long term risks in a region or at national level
	* Enhancing prevention by effective risk communication to the public (in “peacetime”)
	* Risk and crisis communication between actors involved in the DRM
	Communication: Facilitating effective response with early warning systems
Enhance prevention	* BBB (Building back better): Enhancing prevention through a well-organized long-term response
	Systems of early warning for different kind of hazards (floods, tsunamis, volcanic eruptions…)
	* Policies to protect the most vulnerable groups of people (the elder, the children, the disabled…) in emergency situations

Table 1: Table 1 - Some selected macro-themes and topics to be considered for deeper analysis. *: topics collected and analysed in the context of real-life scenarios within three thematic papers.

suing regular periodical publications, a plan was drafted defining the main topics to be addressed through the duration of the project. After the first bulletin focused on the project itself, the other ones deal with: (i) impact of COVID-19 pandemics on the emergency management, (ii) forest fires emergency management, (iii) floods and landslides, (iv) volcanic risk, environmental impacts and earthquakes, (v) drought and food supply, (vi) industrial accidents and environmental pollution. The selection of the topics followed a top-down approach, whereas the retrieved GPs represent a bottom-up contribution. An eighth bulletin was finally dedicated to the results of the project. Bulletins were disseminated via the ROADMAP website (https://roadmap.ci3r.it/publications/), other websites and social media channels, like those managed by the partners, PreventionWeb and the DRMKC website.

In some cases, the bulletins include potential GPs that still needed to be tested, which have been identified as recommendations since the validation phase is missing. This is in line with the process described before, of which the bulletins are one of the first steps.

A more complex level of knowledge systematisation was the in-depth analysis and systematic review provided by the three **thematic papers**. The production of these thematic papers followed, first, a top-down approach. A first round of discussions, mainly involving the ROADMAP consortium, supported by the AG, aimed at selecting three topics. Once the choice was made, a bottom-up approach followed.

The content of the thematic papers, considered as stand-alone documents, was the result of an iterative writing process and exchange of ideas and inputs among the two experts hired to develop each of the papers, the ROADMAP consortium and the AG, which also benefited from virtual meetings. After the outline of the papers was finalised and agreed upon, the two experts developed the content of the paper using desk research. Ad-hoc meetings to follow up the writing of the papers were organised for each thematic paper. The ROADMAP consortium offered inputs and shared thoughts with the experts. When each thematic paper was finalised, the AG was invited to give an external review, and their inputs were then incorporated into the paper. In each thematic paper, the selected GPs were analysed in the context of the Sendai Framework, which was considered the guideline to categorise the GPs with respect to their relevance towards the priorities of actions and targets identified in the Framework. At the end of this process, ROADMAP has provided three thematic papers dealing with GPs in Multi-Hazard Risk Scenarios, Risk and Crisis Communication, and Building Back Better and Leaving No One Behind, respectively (Capone et al., 2022; Tagliacozzo et al., 2022a; Tagliacozzo et al., 2022b).

The organization of three **webinars**[2] was also an effective strategy to share and receive knowledge on GPs. In fact, these online initiatives gathered a relevant number of different stakeholders from multiple sectors. The main goal of the ROADMAP webinars was to share knowledge and activities, to improve DRM community and stakeholders' activities. The ROADMAP webinars were based on the bulletins and the thematic papers contents, following therefore a top-down approach. These contents were previously discussed by ROADMAP consortium and AG, exploring main topics to tackle in DRM. During these events, GPs, recommendations, and lessons learnt in prevention, preparedness and response were shared, discussed and collected. Thus, webinars were used as a strategy to collect GPs and scenario-based perspectives in DRM from well-known experts in their respective fields, following a bottom-up approach. The speakers were also invited to introduce and discuss topics of interest to complement the selected topics, presenting the state-of-the-art and major considerations or developments. GPs, improved methodologies as well as personal expert opinions were also progressively introduced. At the end of each presentation, a Q&A session stimulated the debate on the relevant topics of the webinar.

Finally, this **vision paper** has been prepared to provide DG-ECHO with a future perspective and some recommendations. It is based on all the outcomes described before as well as on the systematization of the GPs in the Solutions Explorer (PART II subsection 4.3.2.).

3.3 Analysis

3.3.1 The challenge of defining a good practice

The research of GPs derives from the iterative process described above, entailing two main steps: 1) the extensive collection of DRR and DRM practices from diverse sources, and 2) the screening of practices to single out the ones that can fit the research scope.

The definition of GPs and of the criteria for identifying them required particular attention from the ROADMAP consortium. The consortium, following the advice of the AG, agreed to abandon the label best practices from the ROADMAP project description, and used the label "good practices" (GPs). Indeed, qualifying a practice as a best practice requires an analysis that concludes without doubt that this practice is superior to any other alternative, i.e., produces results that are better than those achieved by any other means. Since practices are very much influenced by the socio-economic context, concluding that a practice is the best is extremely difficult (or even impossible). The first thematic paper dedicates a specific section to sort out the definition of GPs by proposing the following understanding: "methods or techniques that are ap-

2 1st ROADMAP webinar – 25 June 2021 on "The nexus between Scientists and Decision Makers in Disaster Risk Management". 2nd ROADMAP webinar – 6 December 2021 on "Communication Challenges in Disaster Risk Management and Crisis Management". 3rd ROADMAP webinar – 19 May 2022 on "Challenges and Opportunities for the Future of Research and Practice in Disaster Risk Management"

plied to solve existing problems producing effective results and bringing benefits to the users" (Capone et al., 2022: 11). This definition was also adopted by the second and third thematic papers.
In addition, the first thematic paper set out some conditions to identify GPs by arguing that:
"The GPs approach is result-oriented, i.e. based on the benefits or the impact of a GP, which consists of five elements [...]: effectiveness, reach, feasibility, sustainability, and transferability. A GP is proven (to be as such) by collecting evidence about its successful use in a particular context, thus the quality of available evidence should be considered [...]. GPs are not static instruments, they have to be adjusted as soon as the needs of the users change and/or conditions in the real application field evolve [...]" (Capone et al., 2022: 12).
Finally, in all the three thematic papers the Sendai Framework served not only as reference for the terminology adopted, but also to extract criteria, which helped to refine the search and the analysis of GPs. Its seven global targets and its four priorities for action have been scrutinised to provide GPs in the first thematic paper. In the second and the third thematic papers, not only targets and priorities, but also the articles under each target and priority provided eight and seven criteria, respectively, to be used to find out GPs and state to what extent the GPs achieved the aim of the Sendai Framework about DRR.
The three thematic papers sought to deepen three topics along the lines above. The first one proposes GPs in multi-hazard risk scenarios. Here, we immediately faced the issue to find documents describing and applying GPs in this field. We defined multi-hazard risk events as "concurrent hazardous events, i.e. different (independent) hazards threatening a given (common) area, and related impacts that a selected number countries have had to face, in particular over the past two years, to single out designed and implemented GPs" (Capone et al., 2022: 5). As for scenarios, we followed the definition by the Cambridge Centre for Risk Studies (CCRS, 2020), which labels scenarios as "descriptions of plausible events that may occur in the future, leading to a particular set of outcomes. They are based on assumptions about key driving forces, interconnections, and relationships, and can capture the uncertainties and complexities of a system in a coherent manner". The grey and scientific literature we analysed was wide and articulated in proposing recommendations and guidelines for GPs or in studying real cases where GPs have been applied in DRM, but it did not propose GPs in multi-hazard risk scenarios. We, thus, slightly change our focus by looking for real-life scenarios, "based on present disasters and therefore on situations that actually happened" (Capone et al., 2022: 10). This shift allowed us to find out several cases by selecting concurrent events – in particular, events such as wildfires, severe weather, earthquakes, floods, and volcano eruptions along with the COVID-19 pandemic. Each concurrent event was treated separately, although some GPs could be applied in other concurrent events. To some extent, this is an indication that GPs can be transferable (Spencer et al., 2013).
The same challenge was met in the second and third thematic papers. The second paper on risk and crisis communication used eight criteria to find case studies containing GPs, while in the third thematic paper, on GPs in Building Back Better (BBB) and Leaving No One Behind (LNOB), the same was true for seven criteria. In both these papers, we decided to focus on case studies concerning different types of crises and disasters. These case studies were selected according to inclusion and exclusion conditions to best serve the purposes of the project.
More in general, the bulletins were not as sophisticated as the thematic papers in the search for GPs, as they had the task of conducting an initial and preliminary screening of GPs relating to various topics, without a strong methodology as point of reference. Indeed, the selection of GPs was mainly based on worldwide implemented practices which have led to evident results, and which have, for example, been included in national or international guidelines provided by agencies and other national bodies. Nonetheless, by reporting a mix of GPs (and lesson learned) from case studies, guidelines and exercises worldwide, the bulletins confirmed the challenges encountered in the thematic papers.
The main takes from the three thematic papers and the bulletins were the following.
1. Seldom, a case study spells out that it presents or describes GPs. We needed to analyse the findings of that case study vis-à-vis our definition of GPs and the Sendai Framework to conclude that we actually dealt with a GP.
2. Very few case studies had a truly multi-hazard risk perspective, and even fewer considered scenarios. As a consequence, very few of the GPs we found out were addressing such a context. To improve DRM in coping with multi-hazard risks, there is a need to formulate GPs in such a setting.

3.3.2 How can GPs be systematized in view of a shared understanding?

The GPs found and collected in the thematic papers and bulletins were organized and systematized to promote their effective sharing and eventual re-use, considering the relevant context and possible applicability in other situations.
Firstly, a categorization system was defined according to the characteristics of each GP. In particular, the main structure used for systematizing and organizing the GPs has been based on three main areas. Figure 2 shows these three main areas, which allow the GPs categorization, and the consequent search approach based on three related basic queries: "Solutions to..." for the first round of classification of GPs, "Characterized by..." for the second round of classification, and "Solution features" for the third one.
The first area regroups the GPs according to their scope as well as the phases of the DRM (Figure 2A). Hence, we labelled a GP as: 1) being developed in support of or within an EU legal framework; 2) addressing Targets and/or Priorities of Action defined by the Sendai Framework; and 3) falling in given DRM cycle phase or phases that are most relevant for the GP. As an example of possible GP in this

area, we can mention the issuing of a National Platform of Disaster Risk Reduction, which responds to an indication found in the Sendai Framework.
The second area aims at defining the GP in terms of: 1) spatial and temporal scales (e.g., is a GP applied at local, national or EU/international level?; is a GP applied seldom or often?; does a GP provide a short-term or long-term benefit?); and 2) risk features, both in terms of type of risk (e.g., geological risk; hydrological risk; multi-risk; etc.) and assets at risk (e.g., population, infrastructures etc.; Figure 2B). As an example, you could find here the participatory development of a civil protection plan of a municipality.
Finally, a third area considers a GP in terms of who may benefit from the application of such GP, who are the actors involved, what are the main challenges that can be encountered in the application of such GP, and the type of GP (e.g., a law, a web tool, etc.; Figure 2C). As an example, here you may find some successful communication campaigns aimed at schools.
Based on the above areas, a tool to collect and subsequently allow to search and browse the available GPs was developed as a fit-for-purpose web platform, which was called Solutions Explorer (APPENDIX D).
This tool is designed to allow the existing GPs to be shared and made available to the entire DRM community. It was developed with the aim to increase access to information on DRM and DRR and making them readily available and usable to communities and practitioners. As a living web platform, the Solutions Explorer will provide examples on a broad range of structural and non-structural risk man-

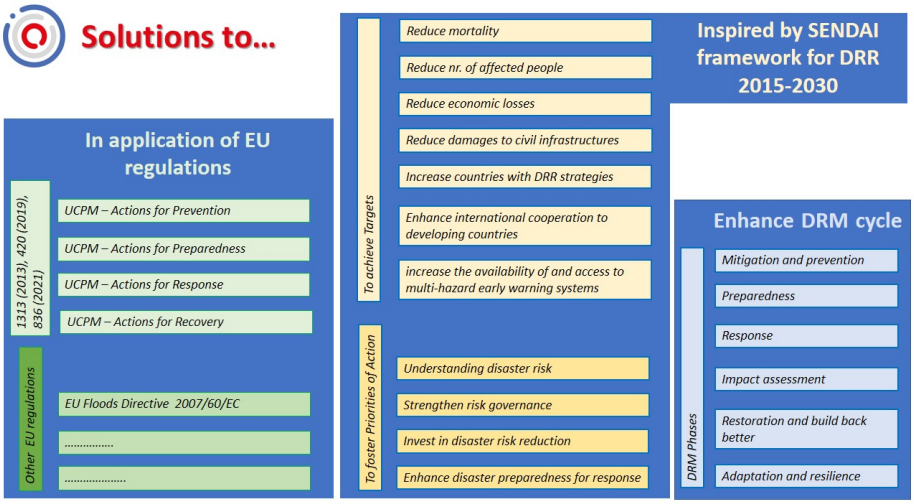


Figure 2A

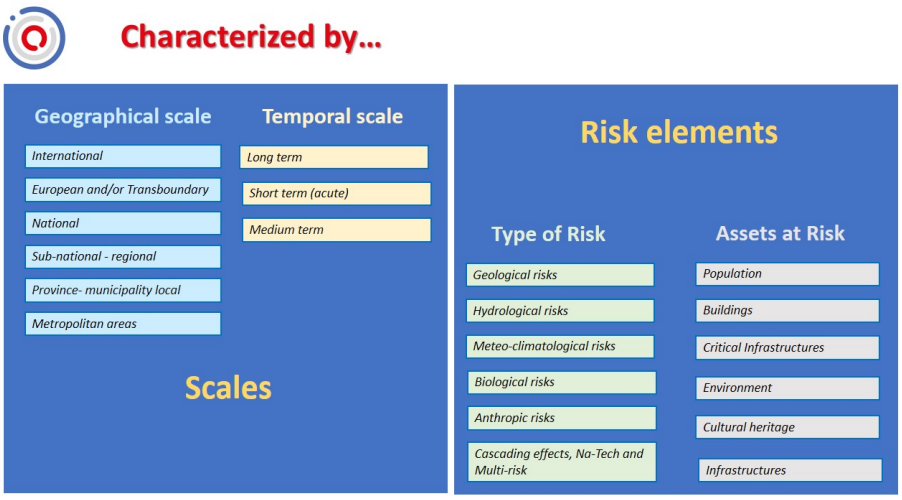


Figure 2B

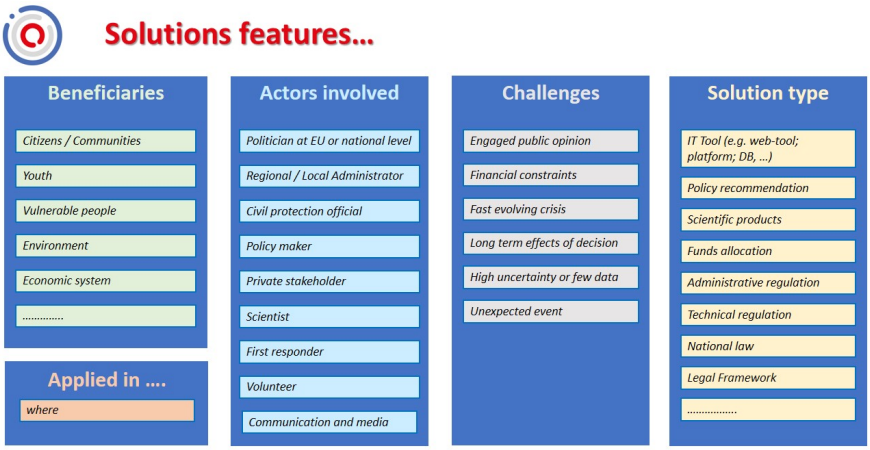


Figure 2C

agement GPs, enabling the sharing of information on how to overcome the obstacles and increasing the understanding of DRM solutions.
This means that the Solutions Explorer needs constant feeding and update of GPs. As a further step, we also envision a crowdsourcing approach, which allows to acquire information on relevant practices and scenarios, potentially to be labelled as GPs, based on the input from the community of DRM stakeholders. To this end, a number of useful approaches could be employed, as discussed in Appendix E. Within the scope of ROADMAP, it was decided to propose a methodology based on questionnaires (APPENDIX C). Even if not applied during the project, the questionnaires are an additional powerful tool to ensure regular input and feedback from the community. Indeed, questionnaires, as an additional feature of the bottom-up approach, can potentially help to collect a larger number of GPs.

4. Results

4.1. From GPs to scenarios

Scenarios and scenario building have become a useful tool for disaster risk managers and civil protection experts at local, national and EU level. The new EU civil protection legislation (Decision 1313/2013/EU; Decision (EU) 2019/420; Regulation (EU) 2021/836) stresses the importance of scenarios in the work of the UCPM in prevention and in preparedness to strengthen the capacity of the Mechanism to intervene when a disaster occurs.
The thematic papers and the bulletins contain several GPs concerning different types of hazards, risks, disaster events, used in several countries by local, national and international authorities, in addition to their application in one or more of the phases of the DRM cycle. We reviewed all the GPs recovered and tried to establish the scenarios in which they could be applicable. This process was a learning exercise that allowed us to understand better how to cope with DRM in a multi-hazard risk context.
Firstly, we reflected upon the DRM cycle in its most comprehensive inclusion of phases and considering it at local, national, EU and international level (Fig. 3).
Secondly, we decided to work on theoretic scenarios, rather than on real life ones, in order to make our reasoning on the GPs more flexible and applicable under the occurrence of different conditions.
We framed into the DRM cycle the potential occurrence of different disaster events, which are reported in the legend of Figures 4, 5, 6 and 7. We considered both rapid and slow onset disaster events, as well as long-lasting emergency conditions. Several events could be linked by a cascading effect. We also took into account the possibility to have some precursors or forecasts.
After a brainstorming discussion, we drew up four theoretical scenarios, among many possible ones, in which we inserted a few GPs among all those available, selecting both the phase of the DRM cycle and the level of governance, from local to international. These four scenarios stemmed from the empirical overview of cases contained in the bulletins and the thematic papers.

- Scenario A: two or more independent disaster events in the same area at the same time (Figure 4);.
- Scenario B: two or more dependent disaster events in the same area at the same time. Here, the time span between the events is short, with cascading effects (Figure 5);
- Scenario C: two or more dependent disaster events in the same area, but delayed in time: one starts, the other(s) follow. Here the time span between the

events is long, with cascading effects as well (Figure 6);

- Scenario D: two or more disaster events in different areas that have to be managed by the same civil protection authority (Figure 7).

Thirdly, we resonated around some GPs that could fit in each scenario to help disaster risk managers and civil protection authorities to mitigate or reduce the disaster risk related to that disaster event. We selected up to three examples of GPs for the sake of illustrating the process and keep the figures understandable. With more sophisticated figures, several GPs could be added without undermining the effectiveness of the approach.
To show these GPs, in the following we selected them from one out of three broad fields of intervention, namely Cooperation, Communication and BBB.
Concerning Scenario A (Figure 4), we can assume that being the disaster events independent from one another, they foresee different authorities in charge, as it has happened with the COVID-19 and other disasters like floods or forest fires during these last two years (see Capone et al., 2022).
GP A1) Cooperation - establishment of a national control room including health and DRM authorities.
GP A2) Communication - promotion of local risk awareness campaigns which take into account how to differentiate the messages in case two or more independent disaster events occur.
GP A3) BBB – issuing new regulations which allow for a more effective reorganization of the civil protection system.
Moving to Scenario B (Figure 5), we can assume there are slow and rapid onset disaster events that are linked by a cascading effect, like a volcanic eruption causing a landslide, which in turn causes a tsunami.
GP B1) BBB - usage of an Economic Recovery Dashboard, which considers disasters events always linked to each other.
GP B2) Cooperation - establishment of multi-level collaboration platform between policy areas and administrative levels and between political authorities and professional expert bodies (see # 12 in Table 2 in Capone et al., 2022).
GP B3) Communication - establishment of a UCPM communication platform.
Scenario C (Figure 6) envisages several disastrous events starting at different times, although in a cascading relationship. An example would be forest fires destroying forests along mountain slopes in summer, which will be affected by landslides in autumn, during the wettest period.
GP C1) Communication - establishment of a UCPM communication platform.
GP C2) BBB - establishment of an international recovery fund that diversifies support according to disaster event.
GP C3) Cooperation – coordination of the fire-fighting air fleets of different countries.
Finally, Scenario D (Figure 7) addresses the possibility to have one civil protection authority, for instance at EU level, that stretches its capabilities due to disaster events occurring in different areas. An important precedent here are the 2019 forest fires in Europe, which involved EU countries (Portugal, France, Italy, Croatia) at the same time. This precedent showed the shortage in aircraft capabilities of the UCPM and led to an upgrade of the Mechanism thanks to the RescEU legislation.
GP D1) BBB - Completion of checklists of material and equipment to be updated each month to minimise the possibility to lack tool when next disaster events strike.
GP D2) Communication – Organization of workshops and meetings to share with EU citizens the UCPM activities to address the DRM and crisis management.
GP D3) Cooperation - Vulnerability assessments provid-

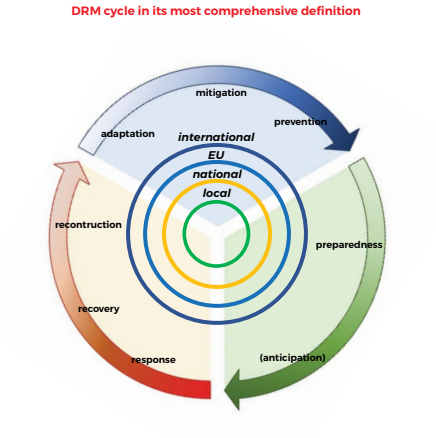


Figure 3: The DRM cycle in its most comprehensive inclusion of phases and considering it at local, national, EU and international level.

ed by several agencies and experts based on Scenario D.

4.2. The value of a community of DRM experts

Nowadays, the availability of knowledge and information is very much facilitated by technological tools. At the same time, knowledge sharing and collaboration are made possible by the existence of networks of experts at various levels, which help to identify existing gaps in science and technology and the needs for further innovation and research.

The joint contribution of scientists/academics, civil protection experts and decision-makers in DRM can provide important support in the construction of a doctrine. Experts' opinions, their critical reviews, reports on their experiences are of great value in building a shared understanding of DRM.

The ROADMAP project has sought to involve, in its various activities, decision makers and experts with different background, working at various specialized stages of the DRM process, in single or in multiple risks, at various scales and scenarios. It has been able to establish, in the year and a half of its existence, a dynamic and adaptive community, through the work performed during virtual meetings and the critical review of bulletins, thematic papers, webinars, the Solutions Explorer and this vision paper.

The first nucleus of this community is represented by ROADMAP Advisory Group (AG), which was composed by high-ranking and experienced experts in various fields of DRM, working inside and outside the academia (PART I subsection 3.2.1.). The members of the AG were selected from networks already operating within the UCPM or other international bodies and platforms and from different countries to provide significant and fruitful interaction and guidance throughout the project. An AG consisting of scientists/academics and decision makers experts, as the one established by ROAMAP, is highly recommended in a top-down approach perspective, since it strengthens the nexus science – policy. In addition, some of them provided bottom-up GPs and experiences. Finally, the same members became a powerful network to disseminate ROADMAP results.

In particular, the ROADMAP AG was really constructive in providing information about GPs and lessons learnt from their respective fields and in reviewing the main outputs of the project, such as the thematic papers and the Solutions Explorer (as well as this vision paper). The AG members contributed, as well, to the selection of relevant topics for the three thematic papers.

Four meetings were planned with the AG during the project. A detailed agenda and documents were provided beforehand to better prepare the discussion towards specific topics of mutual interest. During these (virtual) meetings, the AG members introduced their perspectives as well as innovative ideas and suggestions, providing rewarding guidance.

This first nucleus of community of DRM experts could be expanded, including further advisors from other disciplines and fields of expertise.

The following is an overview of the different institutions and organisations where experts can be found to be involved in a network and make a community. It concludes with a focus on the advisory groups and the specific role the AG has played in ROADMAP.

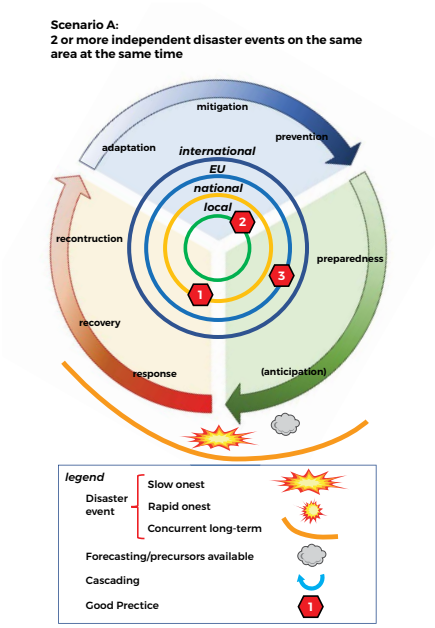


Figure 4: Theoretical Scenario A.

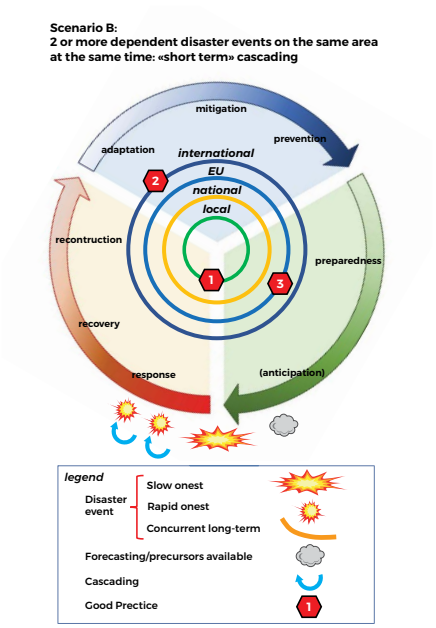


Figure 5: Theoretical Scenario B.

It should be noted that ROADMAP did not involve experts from all these institutions and organisations, mainly due to its short duration. This limitation had some implications for the development of the project, as some topics were only touched upon or not dealt with at all. However, we believe that the awareness of this limitation, together with the criteria adopted in the GPs search from the literature, partly avoided this bias (see PART II, subsection 4.3.).

4.2.1 Research Institutions

A network of experts and knowledge-sharing starts at the research institutions (from public and private institutions, independent, or linked to universities, agencies or enterprises), where fundamental and applied problems are studied, and solutions are found.
In ROADMAP, as in most of the research projects, a consortium of research institutions was established, with the significant addition of an operational national agency such as the Italian Civil Protection Department. Adjustments and iterations were required all the time during the research process, since each research institution had developed its scientific paradigm in studying DRM in the frame of civil protection.

4.2.2 Operational and Governmental Institutions and Agencies

Operational agencies that work in different stages of DRM cycle have personnel with various levels of experience or formal education. Government agencies and public services also employ experts in various fields of risk governance, DRR and civil protection. Sometimes these agents are specialised in a particular field of operations, following a set of established procedures, working in a known environment and using certain types of equipment. It is important to engage with this operational personnel thanks to the experience they have gained on the ground. For the definition of GPs, it is essential to involve these institutions as they can provide a network of experts with a unique point of view and expertise, given their direct experience in the field of DRM, including ICT, data processing, decision support systems, etc.
In ROADMAP, we included an operational national agency such as the Italian Civil Protection Department in the consortium, and we gained expertise from the members of the AG belonging to international and national operational agencies.

4.2.3 Industries and Services

Industrial companies that develop, project, manufacture and commercialize systems and products used in DRM and civil protection operations also require expertise at different levels and need to exchange data and information with other groups of experts to assess the specifications and capability of their products. With due respect for the industrial or commercial rights of each company, a network of experts from various areas should include qualified personnel from these industrial companies to develop innovative solutions to mitigate disasters and their impacts.
The ROADMAP project did not rely on this kind of expertise. Nonetheless, EU framework research programmes like Horizon Europe have increased the presence of these actors in the research consortia, especially when

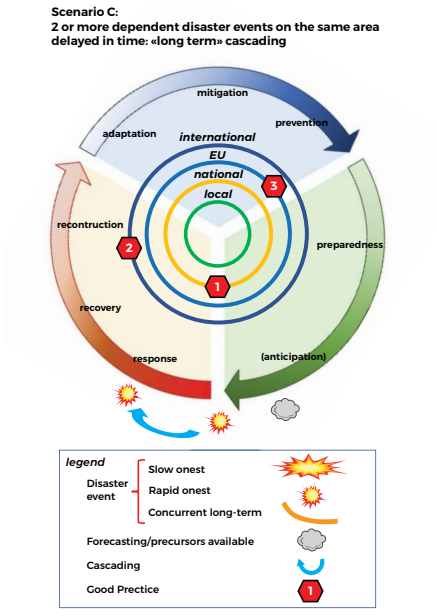


Figure 6: Theoretical Scenario C.

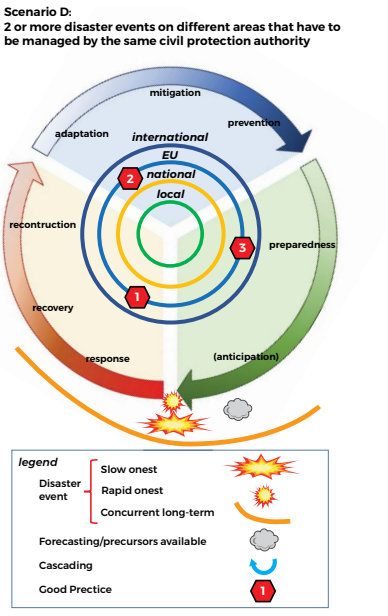


Figure 7: Theoretical Scenario D.

the Technology Readiness Level (TRL) is high and leads to commercialisation of products that support DRM and civil protection activities.

4.2.4 Media agencies

Media agencies have an important role in all phases of DRM, informing and improving the sensibility of the public in relation to the existence of risks in general or about particular disasters. Quite often they invite experts to support the process of communication, either by bringing science or by providing information or comments about policies or operations. In addition, some agencies have specialised journalists that deal with disasters.

ROADMAP did not rely on this kind of expertise, but we consider these participants in the DRM cycle a potential group to involve in future developments of the projects.

PART III

Keywords

Doctrine, Disaster Risk Management, Crisis Management, Good Practice, Civil Protection, Scientists, Decision-makers, Knowledge Network, Solutions Explorer.

Acronyms

AG – Advisory Group
BBB – Building Back Better
BBB – Building Back Better
CCA – Climate Change Adaptation
DG-ECHO – Directorate-General for European Civil Protection and Humanitarian Aid Operations
DRM – Disaster Risk Management
DRMKC – Disaster Risk Management Knowledge Network
DRR – Disaster Risk Reduction
EU – European Union
FEMA – Federal Emergency Management Agency
GFDRR – Global Facility for Disaster Reduction and Recovery
GP – Good Practice
ITC – Information Communication Technologies
JRC – Joint Research Centre
KN – Knowledge Network
LNOB – Leaving No One Behind
LNOB – Leaving No One Behind
NGO – Non-Government Organization
Q&A – Questions and Answers
STEM – Science, Technology, Engineering and Mathematics
TRL – Technology Readiness Level
UCPM – Union Civil Protection Mechanism
UNDRR – United Nations Office for Disaster Risk Reduction
UNESCO – United Nations Educational, Scientific and Cultural Organization

List of References

ROADMAP bulletins

1st bulletin: Learn about the ROADMAP Project and its next steps (2022). DOI: https://doi.org/10.57580/BLT1DOI
2nd bulletin: The impact of the pandemics on emergency management (2022). DOI: https://doi.org/10.57580/BLT2DOI
3rd bulletin: Forest fires emergency management (2022). DOI: https://doi.org/10.57580/BLT3DOI
4th bulletin: Management of the floods and landslides risk (2022). DOI: https://doi.org/10.57580/BLT4DOI
5th bulletin: Management of volcanic eruptions and the associated risks. (2022). DOI: https://doi.org/10.57580/BLT5DOI
6th bulletin: Management of climate change and food supply. (2022). DOI: https://doi.org/10.57580/BLT6DOI
7th bulletin: Management of industrial accident and environmental pollution. (2022). DOI: https://doi.org/10.57580/BLT7DOI
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ROADMAP thematic papers

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Appendixes

APPENDIX A - LIST OF JOURNALS

1. International Journal of Disaster Risk Science
2. International Journal of Risk Assessment and Management
3. Journal of Environmental Economics and Management
4. International Journal of Disaster Risk Reduction
5. Risk Management
6. ICCT Journal - International Centre for Counter-Terrorism
7. International Journal of Earthquake and Impact Engineering
8. Disaster Management & Response
9. Jamba: Journal of Disaster Risk Studies
10. Integrated Disaster Risk Management
11. Journal of Disaster Research

APPENDIX B - LIST OF KEYWORDS USED FOR THE SEARCH FOR GPs

Hazard type	Main keywords
Multi-risk	Multi-criteria decision analysis, adaptation, multi risk governance, communication, multi- risk map
Wildfire	Protected areas, fire, risk assessment, wildfire exposure, wildfire vulnerability, risk mitigation, fire intensity
Flood	Monitoring, resilience, modelling, water retention, hydrodynamic model, land use, remote sensing
Landslide	Landslide mitigation, nature-based-solutions, innovation, societal involvement, landslide hazard mapping, landslide dynamics, landslide monitoring, remedial or preventive measures
Earthquake	Seismic crisis, emergency information, communication, risk perception, seismic risk management, seismic risk mitigation, strategic building, seismic losses, disaster prevention plan
Volcano	Volcano observatories, best practices, eruption forecasting, Hazard communication, hazard assessment, probabilistic forecasts, volcano monitoring, volcanic alert levels, databases
Tsunami	Physical vulnerability, submarine failures, inundation area, cascading disasters, critical infrastructures, resilience, coasts, warning
Hailstorm/tornadoes/hurricane	Climate change, risk management, risk perception, disaster response, evacuation, mitigation of losses,
Drought	Drought vulnerability assessment, drought forecast, climate change, drought risk mitigation, soil moisture exposure
Air pollution	Mitigation strategies, human health, environmental impact, air quality, guidelines
Industrial	Exposure, hazard, risk, assessment, occupational (exposure), work environment, chemical hazard, risk assessment, industrial processes, industrial accident assessment
Nuclear and radiological	Measurements, surface contamination sampling, radiation, detectors, emergency, accident, radiation protection
Pandemic	Public health, covid-19, affective symptoms, anxiety, mental health, containment, scenarios
Cybercrime and terrorism	Hacking, terrorism, cyber security, terrorist networks, cyber threats, cyberspace, crime, attack, emergency management, sustainability

APPENDIX C – QUESTIONNAIRE

The development of the questionnaire has been approached in three different methodological ways. First, from the perspective of professionals and practitioners within institutional bodies: this implies inquiring about what stakeholders did to manage multi-hazard risks in real cases at different DRM stages (i.e., before, during and after the event strike). Second, from the perspective of civil protection policy makers and decision makers in order to identify the elements that institutions consider important and urgent to mitigate multi-hazard risks, as well as to identify the elements that institutions effectively enforce. Third, from the perspective of operational actors and non-institutional practitioners, focusing on the aspects that are included or not in the governmental DRM and DRR agendas, although giving emphasis to the projects that have positive effects on the decision-making process.

The questionnaire consists of four sections that regard the "Profile of respondent", the "Good practice", the "Description of the practice", and finally the "Final remarks".

The section "Profile of respondent" collects basic information on the person who is filling the questionnaire and focuses on the direct or indirect experience in DRR and DRM. The profiling accounts for the 4 respondents' categories and expands upon the familiarity with risks, either in multi- or single hazard context.

At the time being, considered key respondents' categories are:

- DRR professional (civil protection, civil defence, first responders, etc.)
- Governmental official (i.e., governmental authorities/agencies, policy maker, etc.)
- Academic (scholar and/or researcher, etc.)
- Humanitarian (red cross, NGOs, etc.)

Whilst some respondents may represent two or more categories, their allocation into a certain group is based on their primary daily activities and chosen according to their own willing. The questionnaire contains a mix of multiple choice and open-ended questions to profile the respondent and to capture his/her written explanation in addition to rating scales to indicate the familiarity with different types of risks.

The second section "Good practice" focuses on the quality of the practice by means of few questions that guide the respondent towards the selection and description of an activity that can likely be later chosen as good practice.

The section "Description of the practice" is divided in three parts that describe in detail the (part i) "Basic facts", (part ii) "Implementation" and (part iii) "Monitoring and follow up" of the practice. The basic idea is that any proposal can be effectively shared with the wider DRR and DRM community.

Finally, the section "Final remarks" opens to the possibility to receive further feedback from the respondent and to receive consent to be contacted again by the surveyors, if necessary.

1) PROFILE OF RESPONDENT

This section collects personal and professional information on respondents. The personal data we collect are limited to information regarding your experience and expertise in disaster risk management, as well as contact information, such as name, work address or email address, which may allow us to conduct follow up activities. The provision of data is voluntary. Any collected data will be used only for research purpose and will not be transmitted to third parties.

Name(s) Surname(s) *	
Title	
Professional category *	• *DRR professional (civil protection, civil defense, first responders, etc)* • *Governmental official (i.e., governmental authorities/agencies, policy maker, etc)* • *Academic (scholar and/or researcher, etc)* • *Humanitarian (red cross, NGOs, etc)*

	• *Other*
Role/Job type	
Institution *	
Country *	
Work address	
Email contact *	

- Which of the following risks you are more familiar with? Assign 5 to the most familiar ones and 1 to the least familiar.

(a) Geological risks (Earthquakes, Volcanic activity, Landslides, Tsunamis) *	
(b) Hydrological risks (Floods, Wave action, storm surges and coastal flooding) *	
(c) Meteo-climatological risks (Extra-tropical cyclones, tropical cyclones and convective storm, Extreme temperatures, Droughts, Wildfires) *	
(d) Biological risks (Epidemics) *	
(e) Anthropogenic risks (Chemical risk, Technological risks, Nuclear accidents) *	
(f) Cascade effects (NaTech) *	
(p) Others *	

- If you selected "Others", please specify _____

- Are you familiar with multi-hazard or multi-risk disaster scenarios? *

  Yes/No

- Have you ever done documentation or case studies/ developed, or taken part in, projects or practices for single or multi-hazard disaster risk management?

  Yes/No

- Have you ever experienced any disaster or had a role in managing disaster risk? *

  Yes/No

- If yes, please list up to five major single or multi-hazard disasters that you can recall having occurred in your area(s). For each event, please indicate the location, date and type of hazard. *
  E.g. Great East Japan Earthquake, 2011, Earthquake and tsunami

1.	4.
2.	5.
3.	

2) GOOD PRACTICE

This section focuses on the elements of a practice that we deem to be important to ensure effectiveness, reach, feasibility, sustainability, and transferability.

- Can all of the practice be described in such detail that the approach is comprehendible and transferable, allowing for some estimate of effectiveness? *

  Most likely / Partly / Under specific conditions / Unlikely

- Can the practice be effective in addressing similar problems in the future or adapted to diverse contexts? *

  Most likely / Partly / Under specific conditions / Unlikely

3) DESCRIPTION OF THE PRACTICE

Part i) Basic facts:

Name of the activity in English and/or in original language: *	
Where is/was the activity located practice (it is possible to mark more than one answer)? *	• *Africa* • *Antarctica* • *Asia* • *Europe* • *North America* • *Oceania* • *South America*
If possible, specify the location	
What is/was the level of implementation of your example of good practice (it is possible to mark more than one answer)?	• *International* • *National* • *Regional or Sub-national* • *Local (municipality level or metropolitan areas)* • *Other (please specify)*
What stage of the DRM cycle does/did the activity affect (it is possible to mark more than one answer)? *	• *Prevention and prevention* • *Preparedness* • *Response* • *Impact assessment* • *Restoration and build back better* • *Adaptation and resilience*
Does/did the activity address any of the Sendai targets? If yes, which ones (it is possible to mark more than one answer)? *	• *Reduce disaster mortality* • *Reduce the number of affected people* • *Reduce direct disaster economic loss* • *Reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities* • *Increase countries with DRR strategies* • *Enhance international cooperation to developing countries* • *Increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people*
Does/did the activity address any of the Sendai priorities? If yes, which ones (it is possible to mark more than one answer)? *	• *Understanding disaster risk* • *Strengthening disaster risk governance to manage disaster risk* • *Investing in disaster risk reduction for resilience* • *Enhancing disaster preparedness for effective response, and to «Build Back Better» in recovery, rehabilitation and reconstruction*
What are/were the main aim and the main objectives of your example of good practice? Why was the activity done? *	
What are/were the opportunities for DRR? What are/were the gaps in policy that needed updating? *	
Who/What category led the activity? *	• *DRR professional (civil protection, civil defense, first responders, etc)* • *Governmental official (i.e., governmental authorities / agencies, policy maker, etc)* • *Academic (scholar and/or researcher, etc)* • *Humanitarian (red cross, NGOs, etc)* • *Other (please specify)*

Is the activity embedded in a broader national/regional/local policy or action plan? *	• Yes • No
If yes, what is the policy or action plan? Please describe.	

Part ii) Implementation:

Which were the initial barriers, or obstacles, for the activity (if any) (it is possible to mark more than one answer)? *	• *Lack of a shared knowledge within the team (theoretical knowledge, methods, technical language, codes and norms, others)* • *Lack of teamwork (poor communication, unclear tasks, disciplinary segregation)* • *Lack of, or insufficient, context-specific knowledge* • *Lack, or failed application of, participatory methods* • *Unclear regulatory frameworks and procedures (local, regional, national, supranational)* • *Lack of resources (budget and/or staff)* • *Excessive bureaucracy* • *Others (please specify)*
Which of these stakeholders are/were involved in the implementation of the activity (it is possible to mark more than one group of stakeholders)? *	• *DRR professionals (civil protection, civil defense, first responders, etc)* • *Governmental official (i.e., governmental authorities / agencies, policy maker, etc)* • *Academic (scholar and/or researcher, etc)* • *Humanitarian (red cross, NGOs, etc)* • *Representatives of civil society* • *Target groups* • *Other (please specify)*
If you marked "target groups", please specify:	• *General population* • *Children (before adolescence time)* • *Adolescents* • *Young adults* • *Adults* • *Elderly population* • *Women* • *Men* • *Families* • *Vulnerable social groups* • *Other (please specify)*
How is/was the implementation of your example of good practice? *	• *Continuous (integrated in the system)* • *Periodic, please specify:* • *Single - How long did it last? Please specify.*
How long did/will it last? *	
What core activities are/have been implemented (i.e., the activities that have been implemented in order to achieve the objectives of the practice)? *	

Part iii) Monitoring and follow up:

Are/Were follow-up activities considered? *	*Yes/No*
If yes, what do/did the follow-up consist of? How are the long-term impacts of the activity going to be managed and monitored? *	• *Observation* • *Simple feedback (receive feedback and check it against expected outcomes)* • *Feedback loop (feedback and opinions used to shape new changes and improvements)* • *Others (please specify)*

Who is/was in charge of the follow-up? *	
What element(s) that favoured achieving results would you maintain as a good practice? What were, in your opinion, the pre-conditions for success? Were there any facilitating factors? *	
What element(s) would you change in future activities to improve the results? *	
Do you have any website related to the activities?	
Is any report available, preferably in English or at least an English summary? (if yes, please provide link/reference/document)	

4) FINAL REMARKS

- Is there anything not covered in the previous questions, that you would like to add?

- Thank you for your contribution. If you are happy to be contacted and speak further about your good practice, we invite you to give your consent.

  Yes/No

APPENDIX D – Solutions Explorer

The Solutions Explorer is an open-source Web platform that is available to project partners and EC (DG-ECHO, JRC), and eventually will be opened to stakeholders and the general public at the end of the project. This new platform is based on high-level user requirements defined with the ROADMAP partners and members of the ROADMAP Advisory Group. It hosts GPs in DRM available at different governance levels (local, regional, national and international), supporting the activities of ROADMAP (e.g., vision paper, thematic papers, bulletins) described in PART II.

Beyond that, it can eventually be linked with other existing databases (e.g. DRMKC resources, CERIS Project Explorer), with easy access to basic data and experiences in the field of DRM.

A user, after registration can:

1) Add new GPs
2) Browse the existing GPs available in the database

The access to the Solutions Explorer is available here: https://solutionsexplorer-roadmap.ci3r.it/

The Solutions Explorer main structure for organizing the searching and browsing process is based on 3 different main areas where the user can set up searching criteria.

The first area is called “Solutions to” and it is aimed at defining the features of the GPs available in its database in terms of scope and objectives of the required GP. To achieve this result, we have used 3 sub-categories called:

- “In support of EU legal framework”
- “Targeting the Sendai Framework for DRR”
- “Enhancing the DRM cycle”

The second area is called “Characterized by” and is aimed at defining the features of the required GP. In this area the scales (spatial and temporal) and the required risk elements (type of risk and assets at risk) can be selected.

The third area is called “Solution features” and allows for defining specific features of the solution (GP) in terms of beneficiaries, actors, challenges, and solution type.

On the basis of the selected criteria, the Solutions Explorer will show the GPs that are available within its database.

APPENDIX E - Qualitative and quantitative approaches in research on management

Qualitative research is become an increasingly important tool of inquiry in many disciplinary fields and in the larger management research literature (Denzin & Lincoln, 2011), alongside and complementary to quantitative research. Its main advantage is the ability to bring in diverse perspectives, providing a description of a given phenomenon rather than its measurement. According to Yilmaz (2013), research is an “emergent, inductive, interpretive and naturalistic approach to the study of people, cases, phenomena, social situations and processes in their natural settings”. To this end, qualitative research involves diverse methods, methodologies, and research strategies, such as case studies, oral histories, biographical narratives, participant observations, action research, ethnography, focus groups, interviews, grounded theory and action research (Creswell, 1994; Denzin & Lincoln, 2011). By using such techniques, it is possible for the qualitative researcher to study ‘social reality’ from the informants’ perspectives, experiences and knowledge.

There is a vast array of qualitative methods that have, to differing extents, been criticised for their lack of validity and reliability, an issue that has been referred to as the ‘truth value’ (Lincoln & Guba, 1985: 290). Therefore, it has been accepted that it is particularly important for qualitative research methods to be systematic but in a way that does not constrain the types of inquiry required (Hammersley, 1992). However, despite some criticisms of the methods of qualitative research, it is widely accepted that qualitative inquiry has added much depth to the type of research that has been undertaken and such methods have become particularly useful investigative tools (Bazeley, 2013; Marshall & Rossman, 2016).

This approach has been widely applied in studying disaster risk as it is an open-ended and flexible type of inquiry characterized by inductive reasoning (Phillips, 2014). It has been used to contextualize, interpret and understand actors’ perspectives, or to conceptualize a certain phenomenon. Chmutina et al. (2016) investigated how the concept of resilience has become a highly complex, malleable and dynamic political construct with reference to UK policy documents and collecting stakeholders’ viewpoint. The latter was analysed by means of interviews that are analysed through an inductive approach. Drosou et al. (2019) collected data from residents of three communities through interviews (n=30), questionnaires (n=180) and focus groups with policymakers and community representatives. The objective of the study was to understand the specific socio-economic, cultural and political issues that hinder the effective implementation of Blue-Green Infrastructure (BGI) for risk mitigation in Semarang city (Indonesia), as well as to reveal flood experience as well as perceptions of community members regarding flood management. All these studies prove how qualitative methods allow for effectively applying bottom-up approaches in DRM and DRR research.



European observatory on disaster risk and crisis management best practices
Project co-funded by the European Union Civil Protection