engage
Engage Society for
Risk Awareness and Resilience

Deliverable 3.3 – Final Catalogue of societal resilience Solutions

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Abstract: The ENGAGE project aims at linking the informal resilience naturally inherent in societies, communities, and citizens with the formal work of authorities to prepare for, prevent, respond to, and recover from disasters.

This deliverable sums up the entire process of the development Catalogue of Solutions, (CoS), and presents results from the final catalogue. It covers information on how it was developed and what considerations were made, why stakeholders should use it, and how it should be used. Deliverable 3.3 also covers the overall process of how information has been developed, from the early phases of identifying solutions, to how information is structured and created. Examples from the catalogue are provided, both brief and in-depth, together with statistics for the different characterisations. This deliverable explains the contextual factors that affect the solutions implementation and effect in the societies in which they were used, and may be utilized as guidelines for implementing solutions.

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» **PCOS**

- **proposed:** Describes planned content and structure of different sections. Document authors submit for internal review.
- **revised:** Document authors produce new version in response to internal review comments.
- **approved:** Internal project reviewers accept the document.

» **Intermediate**

- **proposed:** Document is approximately 50% complete – review checkpoint. Document authors submit for internal review.
- **revised:** Document authors produce new version in response to internal reviewer comments.
- **approved:** Internal project reviewers accept the document.

» **External**

- **proposed:** Document is approximately 100% complete – review checkpoint. Document authors submit for internal review.
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» **Released:** Executive Board accepts the document. Coordinator releases the deliverable to the Commission Services.

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Executive summary

The present deliverable entails a **systematic description of the final catalogue of solutions** that ENGAGE has developed, the process of collecting and developing information, guidelines for creating content, the implementation of the catalogue, and examples from its content. Moreover, it provides a full overview of the steps towards finalising the catalogue. Although the deliverable contains examples and snapshots from the database of solutions, **the catalogue itself is embedded in an online repository within the ENGAGE Knowledge Platform**, which was developed in T5.5 and documented in D5.5. The platform can be found through the following link: https://www.project-engage.eu/knowledge-platform2/

In essence, the overall aim of ENGAGE is to link informal resilience inherent in society with the formal efforts of authorities and first responders, where "solutions" are means to achieve this goal. **Solutions are defined as any kind of mean or instrument to enhance the interaction between members of the population and formal responders** (first responders and authorities), e.g., technologies, tools, processes, guidelines, or practices. **The objective of the final catalogue is to provide a knowledge repository describing such solutions with implementation guidance**, including important factors of the local context where they have been implemented. Through the catalogue, the goal is to help first responders and authorities leverage the potential of contributions from the population.

The final catalogue provides a set of solutions with relevant basic information. A selection of these is in-depth characterized. The overall structure of the catalogue includes **four main categories of information for a solution; (i) basic information, (ii) purpose and outcomes, (iv) guidelines, and (iii) lessons learnt.** These categories, and their subcategories, have emerged from a systematic process building upon and integrating the results from ENGAGE's technical deliverables. Important factors for selecting and characterizing solutions have been discussed in internal and external workshops with end-users.

The novelty of the catalogue is that it provides contextual guidance to the users. ENGAGE acknowledges the situated and complex nature of societal resilience – and that building societal resilience cannot follow a "one-size-fits-all" recipe. Solutions successfully applied in one area or society might have specific aspects that heavily influence the implementation and use of said solutions. Therefore, in the catalogue, the guidelines and important factors for use and implementation of solutions include these contextual aspects, which provide the users of the catalogue the possibility of a realistic judgment on the applicability to their own context.

The scope of the catalogue is to provide a pragmatic presentation of solutions, however, a more overarching **discussion of contextual and target aspects of solutions is presented** in this deliverable. This analysis provides a model of how a solution operates through contextual and target aspects to achieve an outcome. In the discussion it is pointed out that what is considered a contextual or target aspect will be dependent on the presumed degree of modifiability of the context. The contextual aspects influence the way solutions work on their target aspects. Moreover, solutions are assumed to contribute to diverse **resilience potentials** that subsequently may enable successful coping actions of a society in a crisis.

To validate the final catalogue of solutions, in-depth content for mature solutions was validated, in which the project partners followed the guidelines for creating content. The catalogue was divided into three overarching processes, (a) selection and role allocation, (b) characterization, and (c) documentation. Furthermore, it provides detailed accounts on the who, the what and the how, when it comes to developing content for the catalogue, both for the formal solutions in the catalogue, as well as the informal.

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1 INTRODUCTION

1.1 PURPOSE OF THE DOCUMENT

The purpose of this document, Deliverable 3.3, is to provide a full overview of the Catalogue of Solutions (CoS) for societal resilience. The catalogue is an online repository as part of the ENGAGE Knowledge Platform. The content and structure are developed within WP3. The knowledge platform consists of other content in addition to the catalogue, but this deliverable presents the CoS.

The document serves as a final explanation of the processes of developing the CoS, in which we refer to previous deliverables and work done in other work packages (WP). This covers an overview of the catalogue itself, together with the information structure, the process of developing, implementing and creating content for the CoS, as well as developing the relevant contextual factors for solutions. We also present in this document the informal solutions and how these have been implemented in the CoS.

1.2 INTENDED READERSHIP

The deliverable targets all consortium members in the ENGAGE project. The CoS is one of the central results of the project, and it is therefore essential to share the details on the development of the catalogue, to uphold transparent processes in the project.

The project's Knowledge and Innovation Community of Practice (KI-CoP) members are also an important target group for this deliverable, considering their operational expertise in the field.

The digital catalogue itself is the main output of the efforts of WP 3, and the discussions and process towards it are documented in this deliverable. These descriptions are relevant for the stakeholders and end-users consulting the Knowledge Platform (KP). The CoS is a very useful tool which stakeholders, such as authorities and civil society, can use to meet their needs. Stakeholders can choose from a large range of solutions in the CoS, and adapt the chosen solution to their relevant social context, and thus contribute to enhance societal resilience. This deliverable may also target other scholars and researchers that wish to develop a catalogue, either on different topics, or further develop a catalogue on similar solutions for societal resilience.

Lastly, the deliverable also targets readers that are associated with the European Research Council, the European Commission (EC), and the project reviewers. The dissemination level of the deliverable is public, and it can be shared outside the consortium, the EC, and the project reviewers.

1.3 STRUCTURE OF THE DOCUMENT

The document is split into 8 different chapters in addition to references and appendix. The first chapter is an introduction to the content of the document. The second chapter presents an overview of the CoS itself, while chapter 3 presents the information structure used to develop the CoS. In the following chapter 4, we explain the process of developing the CoS. Here, we include information about identifying solutions, and developing the basic and in-depth information. In chapter 5, we present an overview of how the CoS is technically

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implemented in an Airtable, and how we have used miniExtentions as part of our review processes. The content of the CoS will be presented with thorough examples and statistics in chapter 6. Chapter 7 covers the contextual factors for use and implementation, and chapter 8 an overview of the identified informal solutions.

1.4 Relationship with other deliverables and work packages

The work presented in this deliverable is built on previous deliverables from different WPs and explains the process behind developing the digital CoS. Some of the text in this deliverable has been reused from deliverable 3.1 since many of the same topics are covered. Deliverable 3.1 covers parts of the process of developing information in the CoS up to a certain point (November 2021). Deliverable 3.3 is more extensive since it also covers the contextual factors, the inclusion of informal solutions, and processes that occurred after the D 3.1 was handed in. This deliverable is therefore a document that should summarise discussions, actions and activities in creating the catalogue and collecting and developing the information.

We explain discussions behind different considerations throughout the process that have been occurring in other WP. The information structure of the catalogue is presented in Chapter 3, and the background work here stems from workshops with partners and Ki-CoP members in WP 1 and 2. The processes of proposing new solutions were also done in WP 2, and are presented in deliverables 2.2 and 2.3 (Labaka et al., 2021a, Labaka et al., 2021b). The development of the basic and in-depth information of the solutions and characterization of them are related to work from WP 1 to 5. The technical implementation of the catalogue was mainly done in WP 5, and the contextual factors were developed in WP 1. The chapter on informal solutions is based on work from WP 2 and 4.

1.5 Acknowledgements

We express our gratitude toward the excellent work executed throughout the entire project period and across all work packages. This contributed to the result of which we now present as the 'Catalogue of Solutions'.

As this deliverable is a result of all the great work executed in the relation to the catalogue, we especially want to thank the persons who contributed to identifying solutions, authoring their descriptions and reviewing them: Jannicke Fiskvik (STF), Leire Labaka (TECNUN), John Anderson Rincón Moreno (TECNUN), Bruria Adivi (TAU), Nathan Stolero (TAU), Marita Hoel Fossen (TRC), Alexandra Olson (EENA), George Manea (DSU), Håkon Straume (EVBG), Iñaki Gangoiti (ERTZ), Maya Battisti (CA), Francesca De Donato (ASL), Ivonne Herrera (NTNUSR), Rachele Gianfranchi (O2M).

Additionally, we also wish to thank the persons who contributed to the deliverable 3.1 that this deliverable is built upon. Authors: Asbjørn Lein Aalberg (STF), Jannicke Fiskvik (STF), Siri Mariane Holen (STF). Contributors: Matthieu Branlat (STF), Anniken Solem (STF), Tor Olav Grøtan (STF), Martina Ragosta (STF); Ilaria Bonanno (DBL); Tatjana Beuker (DBL); Leire Labaka (TECNUN); Jan Wörlein (ENS); Alexis Gizikis (EENA), Rose Michael (EENA); Francesca De' Donato (ASL); Carl-Oscar Jonson (KMC); Marita Hoel Fossen (TRC).

1.6 ACRONYMS AND ABBREVIATIONS

Table 1. Acronyms and abbreviations

Concept/term/ abbreviation	Description
Airtable	A cloud-based database of solutions, forming the documented basis of the catalogue
Catalogue of solutions	Records of solutions with documentation
Characterisation	The process of systematically gathering and analyzing information regarding solutions
Contextual factors	Inherent characteristics of society that influences the way solutions work for improving interaction between members of the population and formal arrangements
KI-CoP	Knowledge and Innovation Community of Practice
Knowledge Platform	Online repository, hosting the catalogue of solutions as well as other elements
NGO	Non-governmental organization
Societal resilience	The term *resilience* is a concept that entails a wide variety of ingredients and definitions depending on context, field of expertise and perspective Societal resilience is here defined as "a process that emerges from discourses and actions that are embedded in society, its structure, its values, and bonds" (see D1.1.). Societal resilience is considered a relational approach to the way people cope with disruptive events. See also D1.1. and Section 5 for more discussion on the use of societal resilience as a concept and relation to the catalogue
Solution	Any kind of means or instrument that emergency organizations and authorities can apply to reach the public and improve their interaction with them. This set of means or instruments can be guidelines, practices, processes, strategies, methods, technologies, tools, applications etc. (see D2.2)
Work package	A work package in a research project.
Deliverable	A deliverable in a research project.

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2 CATALOGUE OF SOLUTIONS FOR SOCIETAL RESILIENCE

2.1 CATALOGUE OF SOLUTIONS (COS) - INTRODUCTION OF THE COS

The overall aim of ENGAGE is to link informal resilience inherent in society with the formal efforts of authorities to prevent, prepare for, respond to, and recover from disasters. Throughout its lifespan, the ENGAGE project came across thousands of researchers and practitioners, collecting ideas and solutions to enhance societal resilience. To make this knowledge always available and easily accessible, a dedicated space for information sharing has been built: the ENGAGE KP. The latter is an interactive web platform designed to operationalise knowledge on societal resilience produced by the Engage Project, providing insights on how the whole of society, formal and informal actors, can enhance their capacity to respond to disasters jointly. The Knowledge Platform primarily hosts the so-called CoS, a repository of solutions to improve the interaction between emergency responders, authorities, and civilians in emergency situations.

2.2 WHAT IS COS AND WHY USE IT?

The Catalogue of Solutions includes validated solutions that have been used previously in preparedness work and past crises. The use of these solutions can support the work of first responders, NGO's and public authorities, and contribute to strengthen the collaboration within society when preparing for and responding to disasters. These solutions are comprised of any means or instrument that first responders, NGO's and authorities can apply to reach the public and improve their interaction with them. Several solutions are also usable for civil society actors (NGO's etc.) for their contributions to preparedness work before, during or after crisis. Examples of solutions are guidelines, practices, services, strategies, technologies, tools, and applications that could help enhance the level of preparedness, and interactions with the population. The CoS is expected to assist in preparing for critical events to ensure effective responses from authorities, first responders and the relevant NGO's. The content will serve different purposes connected to the three phases of preparation, mitigation, and recovery from an emergency.

An authority looking to increase risk awareness within a specific region can browse through the catalogue and find solutions that have been employed in other areas and read about real use cases describing the implementation and impact different solutions had. Solutions then need to be adjusted to the specific contexts where the solutions are to be used. While mainly addressing first responders, policy makers and NGOs, the CoS can provide valid support to citizens' risk awareness and scholars' research. The Catalogue of Solutions can thus be used as a source of inspiration for developing or adapting tools and practices to collaborate with citizens before, during, and after a crisis.

2.3 PRESENTATION OF THE CONTENT OF THE COS

Both the content and presentation format of the Catalogue of Solutions are designed to be tailored to the specific needs of the intended user. On the homepage the users are guided through a series of questions and, according to the defined criteria, the algorithm selects the most suitable solutions for each case. Each solution is described in detail and categorised according to different intervention types, kind of hazards, targeted users, and phases during the crisis they can be applied in. It shows how the solutions were implemented during past

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crises, what contextual and target factors played a role and which adaptations would be needed to utilise them in different cultural settings.

User experience and interaction design played a central role in the development of the catalogue. Several navigation paths and visualisation formats were provided to the users to offer fruitful connections among different emergency realities from various contexts. In addition, to make the content easily accessible, smart search technology allows filtering the results in a customised way and visualising the solutions that matches best the filters identified (see Figure 1 below).

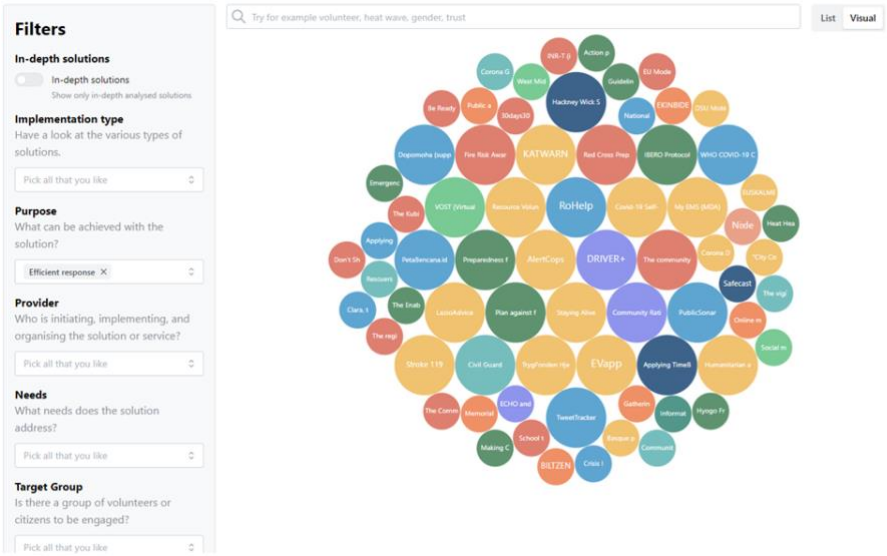

Figure 1. Visual Search Facility for Solutions.

Solutions are presented as a set of bubbles (right side). Their dimensions change based on the match with the filters (left side), offering an easy visual identification of the best solutions for the search settings. When the cursor is moved on a bubble representing a solution, a pop-up window appears. As shown in Figure 2, it is offering essential information about that Solution and allowing the user to decide if to click on it to access more information or look for another one.

In addition to the packed bubble visualisation, users can browse the solutions in the list view.

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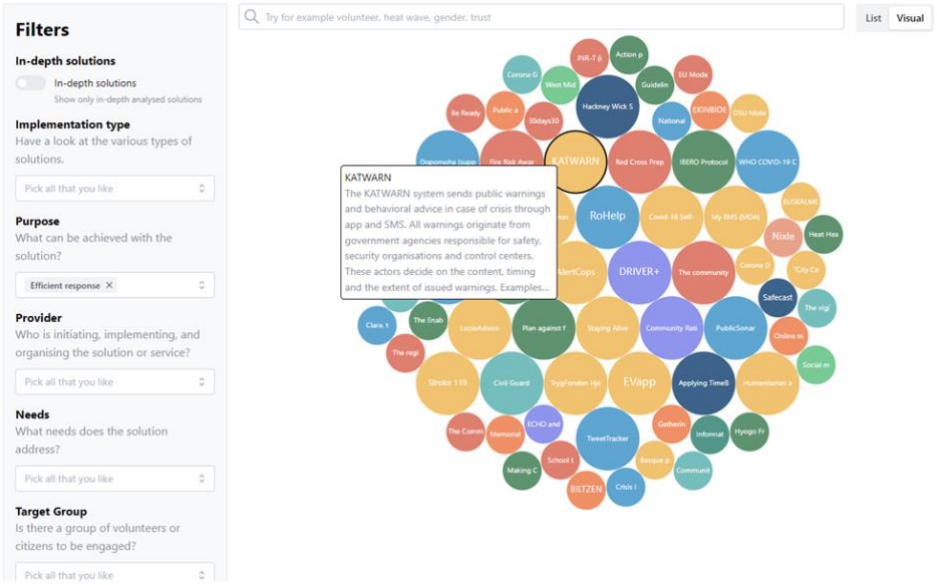

Figure 2. Provision of essential information for the Solution

All the solutions are described using some basic information such as the solution title, short description, where it was used, which emergency responders' need it serves and the solution provider. However, for some solutions we included more in-depth information, or in our words, we further characterised them. We added information such as the contextual factors that impact the implementation of the solution, and to what extent the solution can be applied in another context. The solutions that were chosen for the in-depth characterisation were those that were recommended by the Advisory Board (KI-CoP) of the project.

2.4 Examples from CoS

This section presents two examples of solutions: (i) *Applying TimeBank* and (ii) *30days30ways*. *Applying TimeBank* is a tool aimed to establish a network for the trading of skills and belongs to the category of solutions with basic information. In one page, it is possible to find all the relevant information about the solution: title, year, location, description, purpose, needs, implementation type, phase of emergency, target user, maturity level, solution provider, and further information (see Figure 3 below). Thus, users can instantly get a snapshot of the solution and decide whether they want to further understand it by clicking on the links provided under the section *Further Information*. Doing so will allow the user to read the information that is available and published by the solution provider.

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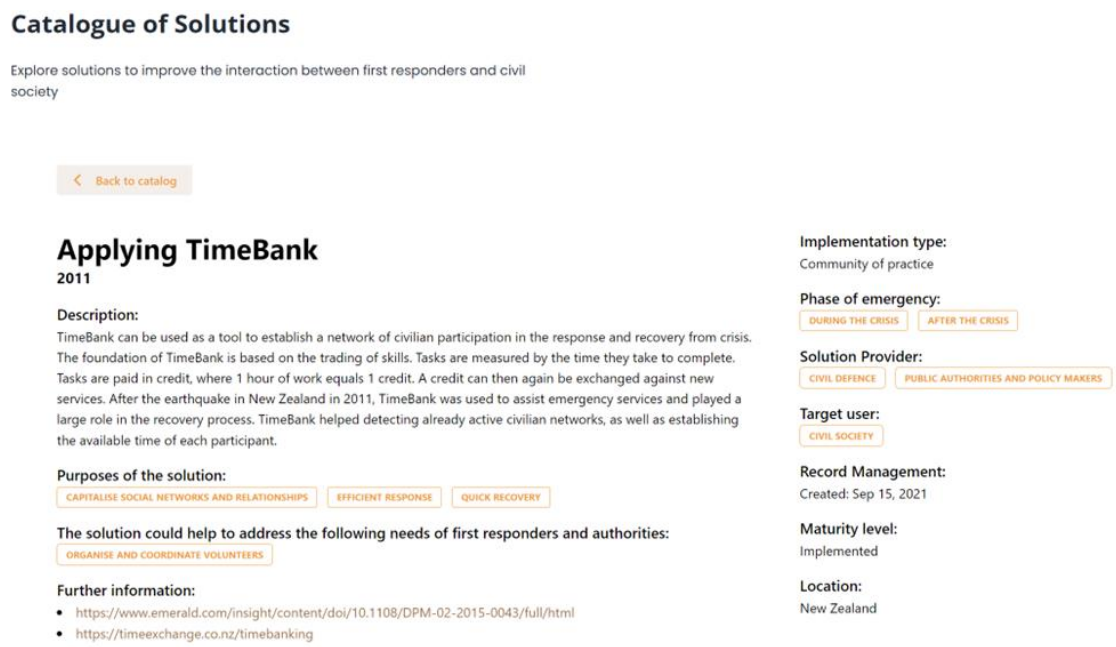

Figure 3. Example of a solution with basic information

On the other hand, *30days30ways* is an awareness campaign of preparedness activities and represents a solution which has been in-depth characterised. It differs from the previous one as there are three additional pages complementing the basic information section: purposes and outcomes, guidelines, and lessons learnt (see Figure 4 below). The additional pages provide the users with the following information about the solution: coping actions, added benefits, degree of transferability, degree of modifiability, important factors for implementation, important factors for use, evaluation from cases, and challenges.

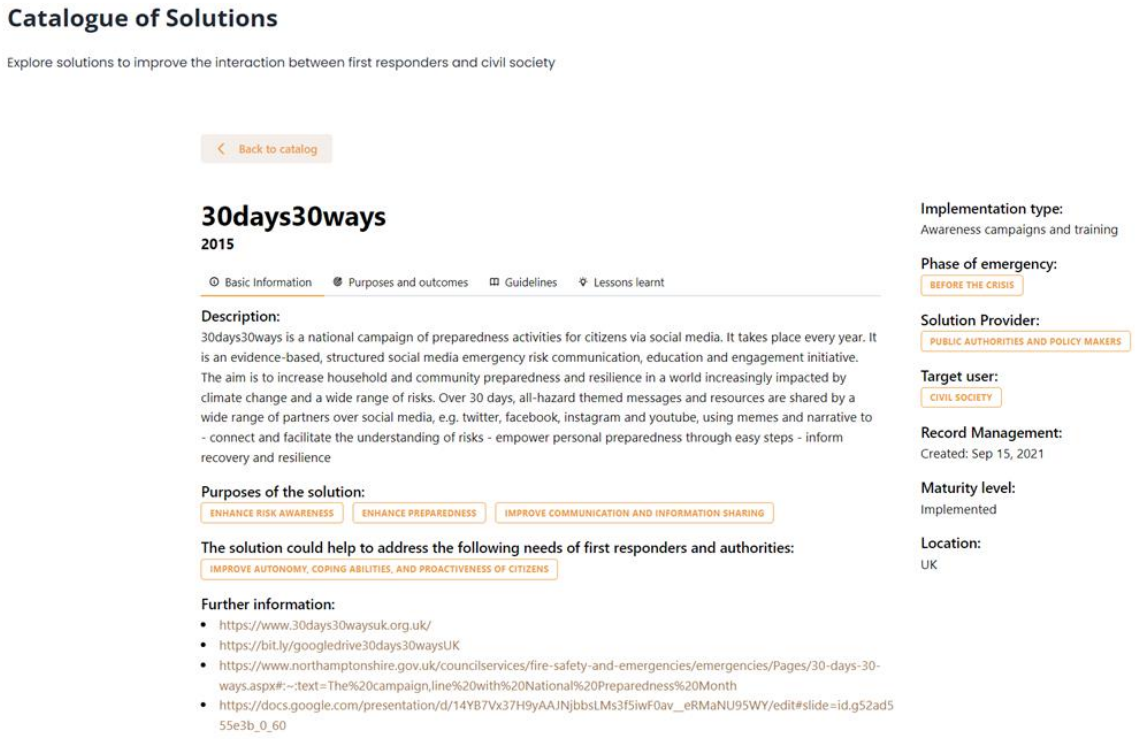

Figure 4. Example of a solution with in-depth characterization

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3 INFORMATION STRUCTURE OF THE COS

The information structure was developed in the first phase of the project. The structure was efficient and useful, and we therefore continued with a similar structure throughout the project. Because of this, some of the text in this chapter is partly reused from Deliverabe 3.1. The new dimension to the information structure that is added after the previous deliverable, is the terminology, explained in chapter 3.4.

3.1 DEVELOPMENT OF THE INFORMATION STRUCTURE

The development of the information structure of the CoS is based on workshops with end-users and KI-CoP-members held during May and June in 2021. The end-user workshop was held in May and the participants were the end-user partners in the project. The main aim of this workshop was to conduct an evaluation of the approach and selection of solutions, and to prepare for the following KI-CoP workshop in June. The questions discussed in this meeting was the organisation of the solutions, how to select solutions, and the essential information that needed to be provided. The KI-CoP workshop was held to get feedback on the project from practitioners, and to discuss involvement of citizens, and solutions that could fit their needs (Information about the end-user WS and KI-CoP WS can be found in Deliverable 3.1, section 3.1.1 and 3.1.2 (Aalberg et al. 2021)).

The CoS information structure is also built on the work in WP1 and WP2. The work in WP1 constitutes a society-oriented perspective, while WP2 constitutes the formal perspective. Several of the categories in the basic information section are based on discussion and work executed in WP2, and to some degree WP1. A large contributor to further develop and enhance the CoS and KP was the evaluation survey (WP4) executed at the EENA conference in April 2023 and the KI-CoP meeting in June 2023. In this survey we asked what relevant content the KP and CoS offer the stakeholders, how and when it is relevant to use these tools, and how challenging it is to use them.

3.2 BASIC INFORMATION

The "basic information" included data about the aim, name, and a short paragraph of description consisting of a maximum of 100 words. We have strived to use the solutions official native name, but have translated it into English and included it in parenthesis, to make the readers understand what kind of solution is presented.

On the webpage, the information is structured with the solution's name on top, and the short paragraph of text in the centre of the page. Below the text, the purpose of the solution, and the needs for first responders are listed. On the left side of the page, the information about the solution type, phase of the emergency, solution provider, target user, date of origin, maturity level, location and further information are listed. At the bottom of the page, suggestions for other relevant solutions are shown.

WP2 developed eight **purposes** that covers aims related to interaction of authorities and emergency organisations with the civil society (see D2.2. for more information), in which each solution aims to fill. The D 2.2 outlined these eight purposes, but following input from the deliverable reviewers, the purposes were revised and therefore expanded. The nine purposes that were applied in the catalogue were: (i) enhance risk awareness, (ii) facilitate resource

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allocation, (iii) enhance preparedness, (iv) capitalise social networks and relationships, (v) improve health and mental outlook, (vi) empower governance and leadership, (vii) improve communication and information sharing, (viii) promote efficient response and (viiii) facilitate quick recovery (See D3.1, section 3.2.1 for previous versions of the list of purposes (Aalberg et al. 2021)).

Needs of first responders originated from a list developed in WP2. Through discussions in WP3, these needs were aggregated into a short and consistent list of five needs: (i) organise and coordinate volunteers, (ii) improve autonomy, coping abilities, and proactiveness of citizens, (iii) communicate with or alert citizens, (iv) improve preparedness level among citizens and (v) improve involvement of and cooperation with citizens. In the work on identifying and collecting solutions in WP2, the solutions were structured across a typology, which later evolved into different **solution types**. A solution can be a web platform, guidelines, an application, or an awareness and training campaign, or other.

The collected and identified solutions from WP2 were categorised based on the **phase of emergency**, the time during a crisis the proposed solutions are useful. This category was delimited to before, during and after the crisis. The **solution provider** is the actor or group that provides the resources (people, money or other) for the solution to work. This characterisation also originates from WP2, and ranges from NGOs to civil society. The **target user** was derived from WP2, and lists the population or groups targeted for the solution. This ranges from first responders, to organised volunteers and students. WP1 the focused on the bottom-up approach and citizens' perspective. Here, it became clear that it is necessary to add the localisation of the solution because of contextual differences between societies. Thus, the **geographical location** of solutions was added. The last section in the catalogue are links to important web pages in which the reader can seek **further information** about the solution. For further information about the creation of each subcategory, see chapter 4. See Table 2, for an overview of subchapter and WP origin.

Table 2. Basic information and WP origin

Basic information characterisation and WP origin	
Further information	WP2
Location	WP1
Needs of first responders	WP2
Phase of emergency	WP2
Purpose	WP2
Solution provider	WP2
Solution type	WP2
Target user	WP2

3.3 IN-DEPTH INFORMATION

A substantial part of creating and developing the catalogue was the characterisation of each solution. The academic partner responsible for the characterisation started the data collection and collected the available and relevant documents about the solution. Interviews was in most

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cases necessary to provide the needed information. The information collected in the CoS were structured along these categories: **"Purpose and outcomes", "Guidelines"** and **"Lessons learnt".**

The "**Purpose and Outcomes"** covers an in-depth information section about each solution, with **extensive descriptions**. This information differs from the basic information, and covers how the solution works, the purposes of the solution and the coping actions. Coping actions are activities intended to adapt to a crisis to overcome its adverse effects. The guiding theoretical assumption of the preliminary model developed in WP1 for assessing societal resilience is that both the coping actions of citizens and the relief action of formal disaster management authorities take place in a larger social context. Thus, it was possible to identify relevant elements of the specific social context by identifying the needed coping actions.

In the section covering **"guidelines",** the solution's degree of transferability to other locations and contextual factors are important, as well as the solution's degree of modifiability. Within this section the important factors for implementation of this solution were elaborated on, and information on what is important to consider during the implementation of the solution. Contextual aspects have been operationalized into two categories, namely, (1) **important factors for implementation** and (2) **important factors for use**. The section about important factors for implementation covers relevant contextual factors when considering the implementation of a particular solution, such as digital literacy or age of population. The important factors for use concerns considerations on factors that influence how the solution functions when in operations, such as cultural conditions and marketing. Moreover, descriptions on whether such a solution could easily be transferred to other contexts are provided (**degree of transferability**), and how easily it could be modified (**degree of modifiability**) (See more thorough information in D.3.1, chapter (3.2.2-3.2.4). Within this section the important factors for implementation of this solution are elaborated on, along with information on what is important to consider when implementing the solution (see further information about in chapter 4.3.2).

The **"Lesson learnt"** section includes evaluation from cases in which the solution has been used, and covers challenges associated with the use of the solution. Here it is important to cover information on what we can learn from each of these cases. **Evaluation from cases** was highlighted in the KI-COP WS in 2021. Here, they emphasised the importance of evaluations from specific cases of the solution, and that the impact and outcome of applying the solution is presented. Furthermore, both workshops with end-users and the KI-CoP highlighted the importance of knowing the status of the solution in question. More specifically, it is perceived as crucial and relevant for users to understand the validity and/or applicability of the proposed solution. The subcategory **challenges** and **requirements were also** highlighted in the KI-CoP workshop, and covers aspects such as resource intensiveness, cost and effectiveness. The prerequisites for the solution to function properly were included in the sub-category requirements. The information in these sub-categories were presented with relevant contextual information.

3.4 GLOSSARY

During the last year of the project a Knowledge Platform Task Force was established to enhance and finalise the content of the CoS. The task force consisted of members across different work packages, to ensure input from several parts of the project. Here, several discussions were made to improve the characterisations used for basic and in-depth information.

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The content of the Knowledge Platform uses a number of terms related to tools and methods for disaster management and citizens' participation in disaster management. The terms are used in the presentation of the solutions included in the Catalogue of Solutions. Some of them are used in filtering. It is therefore necessary for all project partners to have the same perception of the characterisations applied for the basic and in-depth solutions. To ensure this the task force developed a glossary with definitions for all characterisation and sub-characterisations.

To enhance and finalise the CoS, the task force also merged and deleted affluent categories. We also changed characterisations if we meant that the solutions were mis-characterised. For the full list of the definitions see glossary attached in chapter 10.1 in appendix.

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4 PROCESS OF DEVELOPING THE COS.

In this chapter we will explain how the process of developing the CoS was done, both through the identification of solutions in the beginning, to proposing new solutions during the process. We will also address how the information was reviewed. This chapter is partly reused from D 3.1, but also rewritten and adjusted based on internal documents and additional relevant information.

4.1 IDENTIFYING SOLUTIONS

The initial solutions in the CoS were identified through several steps in WP2, both through detecting solutions in scientific literature, through project reports and ENGAGE workshops. When consulting scientific literature, a systematic literature review was conducted. Also, Europeans research projects and international reports were consulted together with analysis of case studies. The second and third steps of identifying solutions were through workshops with end-users, KI-CoP members and project partners. For more thorough information on the process of identifying solutions, see Deliverable 2.2 and 2.3 (Labaka et al., 2021a, Labaka et al., 2021b).

4.2 PROPOSING NEW SOLUTIONS

Project partners and external users had the opportunity to propose new solutions to the CoS throughout the project. In this process, there were different guidelines depending on which actors wanted to propose. External users used a form through the miniExtension portal. Project partners also used this form, or directly through the Airtable. When proposing new solutions, both actors had to put the review status to "To be considered", so that the WP3 leader could consider the relevance of the solution in the following steps. For the full instructions of how to propose new solutions and an overview of the miniExtension portal, go to subchapter 10.2 and 10.3 in appendix.

When project partners were selecting among solutions to be implemented, several considerations were made, and several selections criterions used, see list below:

- Involve interaction with citizens or participation of citizens.
- Corresponds to a gap, or type of solution previously unidentified.
- Is successfully implemented/used somewhere.
- Is something we can find sufficiently detailed information about (even better, we can contact people involved in developing or implementing it).

If decisions could not be made based on the provided information, the WP3 leader had to ask for additional information from the proposer of the solution. The field review status should be set to "More basic information needed". If the solution fulfilled the criteria, the WP3 leader then assigned an author and a reviewer for the solution. The field review status was set to "In progress of gathering basic information". Otherwise, when criteria are not fulfilled, the field review status was set to "To be excluded from catalogue". A flow chart of the process the WP 3 leader needed to conduct is shown in below Figure 5.

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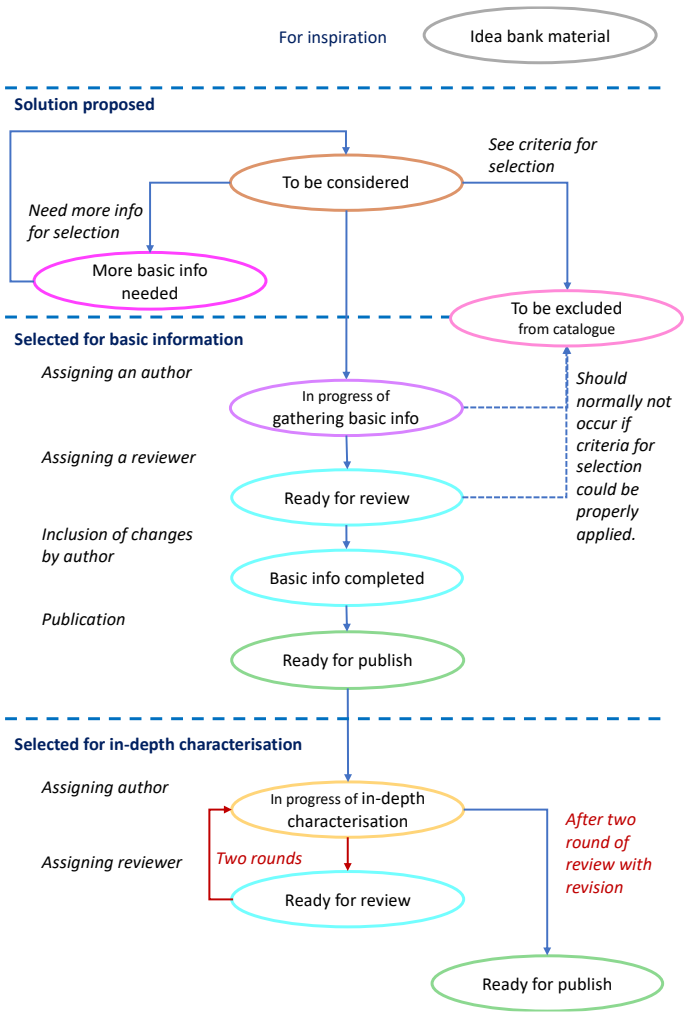

Figure 5. Flow chart over the process of characterisation solutions

4.3 DEVELOPING BASIC CONTENT

An important challenge that became clear in the discussions during the KI-CoP workshop in 2021 (see D 3.3 chapter 3.1.1 for more information) was the balance between in-depth information and brief and basic information. The advantage of the in-depth information is the rich information that can be made available for potential users. On the other hand, feedback from Ki-Cop's stated that this information could be overwhelming for to navigate through.

Based on the end-users and KI-CoP workshops, work done in WP1, WP2, WP4 and interactions between WP3 and WP5 (explained in D 3.3, chapter 3.1), we developed twelve categories of basic information that were collected and presented in the CoS. Most subcategories stem from work in WP2, where we identified promising solutions that may improve the interaction between authorities, emergency organisations, and the civilian population.

To improve the content and structure of the CoS, a "Knowledge Platform task force" was established the last year of the ENGAGE project. The main task here was to make it more understandable for the stakeholders and potential users of the KP and CoS. This included "cleaning up" each category, subcategory, merging similar characterisations, and deleting affluent ones. The task force consisted of members across different work packages, to ensure input from several parts of the project.

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Among the subcategories of 'Basic information', **a solution name** and a **short description** (up to 100 words) was included, to highlight the main essence of the solution, and the specific **solution type**. In the work of identifying and collecting solutions in WP2, the identified solutions were structured according to a solution typology. A solution can for example be a web platform, guidelines, an app, or an awareness and training campaign. All information was based on a form called "Content creation instruction" in chapter 10.4 in appendix, which outlines how information about solutions should be added. The task force discussed the different solution type categories. In this work, we made sure to sharpen the solution type category and merge categories that were overlapping. This work was done to enhance the preciseness of the solution types. Some of the identified solutions from WP2 never made it to the CoS and were erased from the Airtable.

Another subcategory is the **purpose** of the solution. This category was discussed in WP2 and covers the benefits that the solutions help to achieve when improving the interaction of authorities and emergency organisations with the population. WP2 identified eight interaction purposes that solutions aim to address (see D2.2 for more information), but because of a lacking quality, a ninth purpose about quick recovery was added. The same list of purposes has also been used in WP4 with some modifications. The nine purposes include the following: (i) enhance risk awareness, (ii) facilitate resource allocation, (iii) enhance preparedness, (iv) capitalise social networks and relationships, (v) improve health and mental outlook, (vi) empower governance and leadership, (vii) improve communication and information sharing, (viii) efficient response and (ix) quick recovery.

Considering the target groups of the catalogue, the needs and expectations of first responders and authorities are important to consider when developing the information structure. Disasters are complex situations that require the involvement of varied stakeholders with different roles and responsibilities. In this vein, the involvement of society in dealing with crises is necessary to cope with complex disaster situations. However, to properly use the population's abilities and capacities in dealing with crises, it is necessary to know what emergency services and authorities need and expect from the communities so that they can better respond to these and facilitate the recovery from disasters.

The content of the subcategories **target group** and the **solution provider** were initially very similar and were both developed from the work in WP2. Following the task force discussions, the two lists were changed, and differed quite extensively. The solution provider was described as the organisation responsible for providing the solution or using the solution to provide a service to the target population. For example, a company may provide an alert system to authorities, and authorities use this solution to provide an alert to citizens. The target groups are defined as the individuals or organisations for which the solution or service provided by the solution is aimed at. For instance, citizens may be the target group for awareness campaigns.

WP2 identified needs and expectations that emergency organisations and authorities have towards the population in order to cope better with crises. The subcategory **'Needs of first responders'** is based on this list. The list is based on a survey that was carried out to identify and prioritise the needs and expectations of emergency organisations and authorities. In addition, semi-structured interviews were carried out to understand better what and why they have these needs and expectations, and the current barriers or limitations when involving the population in managing crises. The identified aspects were important for first responders and authorities, to provide directions for selecting solutions. This category contained different needs for first responders, that following a discussion in WP3 were aggregated into these five categories of needs: (i) Organise and coordinate volunteers, (ii) Improve autonomy, coping abilities, and proactiveness of citizens, (iii) Communicate with or alert citizens, (iv) Improve

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preparedness level among citizens and (v) Improve the involvement of and cooperation with citizens.

The identified solutions were categorised according to which **phases of disaster management** they are relevant for. We also collected **links to more information**, which are included in the catalogue so that it is available in case a user is interested in accessing the additional information. Lastly, from the studies of WP1, focusing on the bottom-up approach and citizens' perspective, it became clear that it was necessary to add the localisation of the solution because there are important contextual differences between societies. Therefore, we sought to include information about the **geographical location** of the solutions. Overall, the main category of basic information includes the following subcategories:

- solution name
- short description
- solution type
- purpose
- needs of first responders (aggregated needs)
- year of launch
- maturity level
- target population
- phases of disaster management
- geographical locations
- further information

4.4 IN-DEPTH CHARACTERISATION

A large part of the work in the CoS was to characterize each solution. The academic partner responsible for the characterisation initiated a data gathering with available and relevant documents about the solution. Interviews were in most cases necessary to obtain thorough information for developing the lessons learned from the solution. Considering that the total amount of data and analysis might be gathered from different sources and with different methods, an analytical summary needed to be done and documented in a template.

The in-depth information has been created through data collection through document study and interviews of relevant actors (see interview questions in the appendix in chapter 10.5).

The information is structured within these categories: **"Purpose and outcomes"**, **"Guidelines"** and **"Lessons learnt"**. The "**Purpose and Outcomes"** cover a more in-depth information section about each solution. This information differs from the basic information, is more thorough and in a larger degree covers how the solution works, purposes, and particular coping actions. The **"Guidelines"** cover the solution's degree of transferability to other locations, contextual factors, and the degree of modifiability. Within this section, the important factors for implementation of this solution are elaborated on. The **"Lesson learnt**" section includes evaluation from cases in which the solution has been used, and challenges associated with the solution.

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4.4.1 SELECTING SOLUTIONS FOR IN-DEPTH CHARACTERISATION

First round (based on D 3.1)

Most solutions were identified in past efforts of the project, but for the in-depth characterization, a selection between already existing solutions was needed. Thus, a decision was made concerning the need for (a) no further documentation, (b) basic description and representation in the catalogue, (c) in-depth characterisation and representation of the solution in the catalogue. The comprehensive list of solutions was narrowed down to a net list of solutions according to the following criteria:

1) is it addressing a need from first responder or authorities? (**yes**/no)
2) is of a high maturity? (proposed – **planned** – **implemented**)

The selection of solutions for the catalogue is based on qualitative criteria, formed as questions (Q1-Q4 below), which was subject to expert judgments considering the available knowledge on the solution:

Q1 Do you think this solution could be applied to other regions/contexts? (transferability and modifiability)

Q2 Do you think it will be possible to gather information regarding its use and outcomes? (availability)

Q3 Do you think this solution could have a high societal impact? (effectiveness)

Q4 Is it difficult to answer the questions because of current lack of information – but I believe this solution is interesting? (relevancy)

The criteria were thereafter applied to a simplified DELPHI-inspired process for selecting solutions. You can read about the DELPHI-process in D 3.1 chapter 4.1.1.

Second round (based on instructions used in the project)

For the second round of the in-depth characterisation of solutions we arranged a poll for Ki-CoP members to participate in. Members of the Ki-CoP were asked to review solutions in the catalogue and give a prioritisation score to those they found to be more interesting, shared their opinion on the knowledge accessibility and the gaps in purpose and needs. The used form and results are attached in appendix in subchapter 10.6. The criteria for the selection in this round are listed below:

- Prioritisation score (ranking by the Ki-CoP).
- Access to knowledgeable people and data.
- Gaps in solution type, purpose and needs, when looking at solutions that have already been in-depth characterised.

We used the results from the poll to further select the second round of in-depth characterisation. Through the form, Ki-CoP members were also asked to provide feedback if they had information about particular solutions. The five solutions listed below had a contact person listed in the poll:

- ID 6, Everbridge Public Warning
- ID 29, Trygdfonden Heart resuscitation app
- ID 7, City Connect (in Hebrew)

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- ID 66, Information hotlines (Call Habriut)
- ID 65, Emergency hotline (EENA)

Subsequently, we looked at the gaps of the first round of in-depth characterisation, and aimed to close these gaps. Here, we investigated the most covered solution types, purposes and needs in the first round, and attempted to choose solutions that covered gaps in solution types, purposes and needs in the second round. Based on these considerations we went further with the solutions delineated in Table 3. Here, we have also provided the solution type, purpose, aggregated needs, and our justification based on the gaps from the first round. One solution is not included in the table, (Applying TimeBank, ID 87) because we were unable to establish a contact point with any of the responsible persons.

Table 3. Overview of solution type, purpose and needs in the second round of in-depth characterisation.

ID	Name	Solution type	Purpose	Aggregated needs	Justification
1	HartSlagNu	App	- Enhance preparedness - Improve health and mental outlook - Efficient response	- Organise and coordinate volunteers - Improve autonomy, coping abilities and proactiveness of citizens - Communicate with or alert citizens	The information for HartSlagNu was erroneous, and needed revision. As information is available in Dutch, we contacted the solution provider. We found the solution relevant allowing comparison with TrygFonden Hjerteløber (Heartrunner).
3	Ro-Alert system	Alert system	- Improve communication and information sharing - Enhance risk awareness	Communicate with or alarm citizens - Improve autonomy, coping abilities and proactiveness of citizens	High ranking; Similar to Everbridge Public Warning allowing for comparison
6	Everbridge Public Warning	Alert system	- Improve communication and information sharing - Enhance risk awareness - Efficient response	- Communicate with or alarm citizens - Improve autonomy, coping abilities and proactiveness of citizens	High ranking; easy access knowledge; covering gap solution type

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ID	Name	Solution type	Purpose	Aggregated needs	Justification
7	"City connect" (in Hebrew)	App	- Enhance risk awareness - Improve communication and information sharing	- Communicate with or alarm citizens - Improve autonomy, coping abilities and proactiveness of citizens - Improve preparedness level among citizens	Ok ranking, easy access to information
20	Crisis information website	Web platform	- Enhance risk awareness - Improve communication and information sharing	- Communicate with or alarm citizens - Improve autonomy, coping abilities and proactiveness of citizens - Improve preparedness level among citizens	High ranking; covering gap solution type
23	My112	Apps	- Enhance risk awareness - Improve communication and information sharing - Efficient response	- Communicate with or al citizens - Improve autonomy, coping abilities and proactiveness of citizens	High ranking
29	TrygFonden Hjerteløber (Heartrunner)	Apps	- Enhance preparedness - Improve health and mental outlook - Efficient response	- Organise and coordinate volunteers - Improve autonomy, coping abilities and proactiveness of citizens - Communicate with or alarm citizens	High ranking; easy access knowledge, covering gap in purpose

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ID	Name	Solution type	Purpose	Aggregated needs	Justification
64	Norwegian Index for Medical Emergency Assistance	Call centre	- Improve communication and information sharing - Facilitate resource allocation - Efficient response	- Communicate with or alarm citizens	Relative high ranking; covering gap solution type
65	Emergency hotline (EENA)	Call centre	- Facilitate resource allocation - Improve communication and information sharing - Efficient response	- Communicate with or alarm citizens - Improve autonomy, coping abilities and proactiveness of citizens	Added in response to Alexandra's email good ranking; covering gap solution type Connected to the app My112 allowing for comparison
77	Community and opinion leaders	Collaborative methods and technologies	- Enhance preparedness - Capitalise social networks and relationships - Empower governance and leadership	- Organise and coordinate volunteers - Communicate with or alarm citizens - Improve autonomy, coping abilities and proactiveness of citizens	Relatively high ranking, covering a gap on solution type and purpose
79	Civil Guard	Collaborative methods and technologies	- Facilitate resource allocation - Capitalise social networks and relationships - Efficient response	- Improve autonomy, coping abilities and proactiveness of citizens - Communicate with or alarm citizens	High ranking; covering gap solution type

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ID	Name	Solution type	Purpose	Aggregated needs	Justification
177	Petabencana	Web platform	- Improve communication and information sharing - Capitalise social networks and relationships	- Communicate with or alarm citizens - Improve involvement of and cooperation with citizens	Fill a gap regarding "involvement of and cooperation with citizens" Added in response to Alberto's email

4.4.2 In-Depth information

After selecting the solutions for in-depth characterisation, we then decided which partner was to do the data collection. This decision was largely based on the home country and/or region of partner institutions, in relation to the available sources of information. This was done to diminish the language barriers in the in-depth interviews as much as possible. In addition to this, was each interviewer's extensive social and political understanding of each solution. The information in the following section stems from D 3.1 because the data collection process and the characterisation of solutions worked well earlier in the project, and to provide continuity in our work we chose to continue with the same approach.

4.4.2.1 Data collection

One of the first steps in the characterising the solutions was to collect and review documents, articles or websites about the solutions. The total amount of data collection and analysis was gathered from different sources and with different methods. In most cases, document analysis was not sufficient to gather the needed information, and due to this, interviews were used in addition. The respondents were carefully and strategically (Flyvbjerg, 2006) selected based on their knowledge and experiences. By using qualitative interviews as our method, we gained in-depth knowledge of concepts, opinions and experiences (Kvale & Brinkman 2009) from each respondent's knowledge of the solution. Our interest in the interviews was to explore and understand the contextual conditions and factors of each solution (Yin, 2009), which can only be done through semi-structured interviews.

The interview questions covered topics such as, background for developing the particular solution, the user experiences, implementation and modification process of the solution, the context surrounding, and potential evaluation of the solution. For the full list of questions, see the attached interview guide in appendix (subchapter 10.5). The main aim of the data collection through documents and interviews was to cover the following perspectives (1) the developers, who can describe or have documented what the solution is supposed to do, and how it's supposed to be used; (2) the implementers; those who have used the solution in a use case, and may have made adaptations, (3) those impacted by the solution, authorities/emergency organizations, civilians - who can describe how the solution is working in practice for them. The sources of information for (1), (2), (3) are diverse and overlap. Interviews will help us collect insights on the 3 perspectives, although depending on who is interviewed, the information might be more centred on one or the other.

4.4.2.2 Analysis

After the data collection process, we used an in-depth characterization template to guide the in-depth data collection and compilation before it was uploaded into the Airtable (see template in appendix subchapter 10.5). The process of analysing data varied in the degree of analytical

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involvement of the researcher. Synthesising and summarising reports and interviews required some analytical efforts, for example knowing the specific aims of the catalogue and the descriptions of relevant elements. One could distinguish between various levels of analysis, although with overlap. Basic descriptions of the solutions, for example name, required little or no analytical involvement, and could be gathered directly from solution providers or users. Synthesizing and summary of reports required some analytical efforts, for example knowing the specific aims of the catalogue and the descriptions of relevant elements. . Lastly, what we considered as high analytical involvement, was analysing contextual factors, modifiability, and transferability, and analysing raw data from informants regarding these elements. This was carried out by a research partner. One of the last steps in the process was to characterise the solutions in an Airtable, based on the information collected. This was also carried out by a research partner.

4.5 Review process for basic and in-depth information

The review process for basic and in-depth characterised solutions has been developed in a document in WP 3, in which all solutions were reviewed based on the same instructions. One of the aims was that reviews were evenly distributed among partners to even out the workload for all partners. The review involved all consortium partners: academic partners and end-user partners, and there were two reviewers, one academic and one end-user.

The authors of the solution were required to notify the reviewer when the complete information was added to the miniExtension author forms. The review itself was done in the miniExtension review form. The content was reviewed based on the reviewer's opinion about the solution regarding the review instructions.

In the review of the basic information, most of the data was taken from fixed lists, and therefore took little effort to review. The categories' solution name, description, solution type etc (all mentioned in chapter 4.2) were checked and reviewed. In the in-depth solution review, the reviewer assessed if the information is sufficiently thorough, how it is written, and if the solution's information, purpose, important factors for implementation, use and effectiveness were written out in a clear way. Web links also needed to be checked to ensure accuracy.

To provide a coherent presentation of the catalogue content, both basic and in-depth solutions were checked for grammatical mistakes. Because of this, the reviewer needed to correct the grammar, ensuring that the spelling was in British English, with easy and understandable language, avoiding abbreviations and acronyms.

For each case the reviewer perceived the need to improve or change the text, the reviewer wrote a comment in the miniExtension reviewer form. After this has been done for both reviewers, the author implemented all the proposed changes.

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5 IMPLEMENTATION OF THE COS

5.1 DATABASE STORING THE CONTENT OF THE COS

The content for the final catalogue is stored through Airtable[1], a cloud-based relational database application that gives all project participants the updated information about the solutions and cases. Airtable was chosen as the documentation platform as it is an environment that allows for a useful overview of the solutions, as well as the possibility to insert new solutions as the project evolves.

Airtable allowed us to gather information from external actors, through forms that directly update the information in the catalogue (see section below). Furthermore, the tool may be distributed to partners in a convenient way for the creation of structured content, with capabilities for import or export in standard structured formats, facilitating the incorporation of results from WP2 and use of catalogue content in the KP. See an overview of solutions in Airtable below in Figure 6.

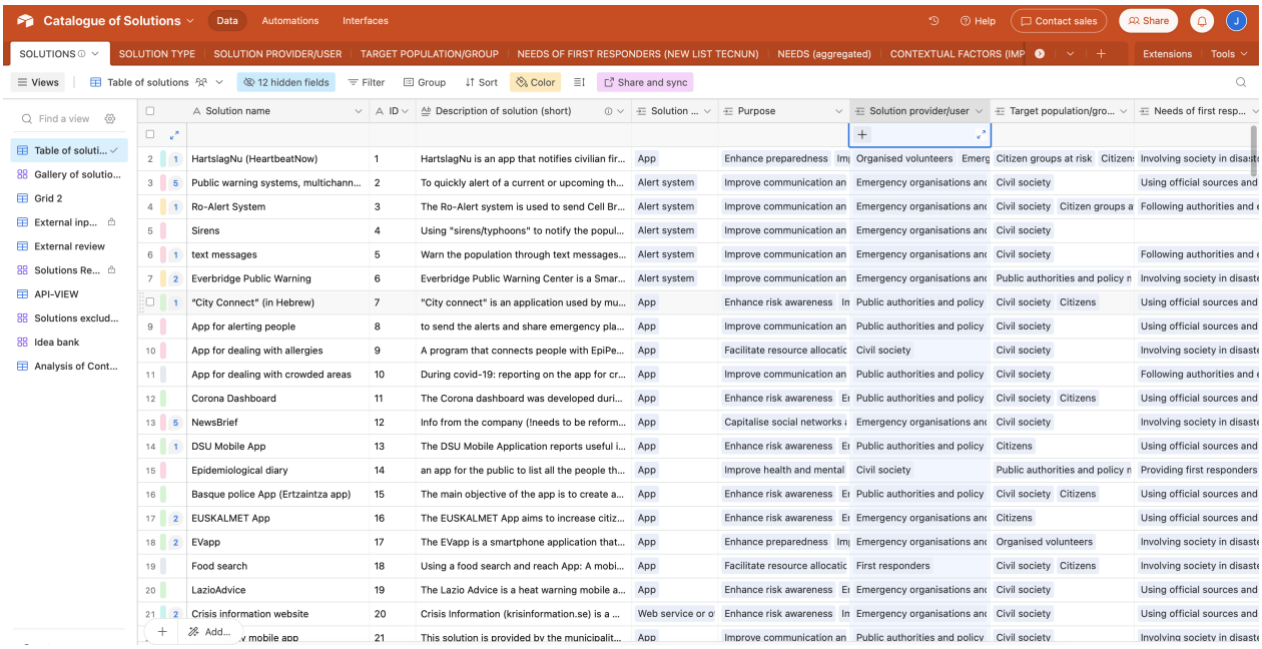

Figure 6. Screenshot of the collaborative Airtable database where content for the catalogue is stored.

5.1.1 MINIEXTENSIONS

Airtable is a very convenient and simple shared relational database. However, it lacks rich features for some purposes. As a result, it is common for Airtable users to rely on "extensions", i.e., apps developed by other companies that provide special capabilities (e.g., more graphically pleasing access to data or simpler management of data structure). In ENGAGE, we have decided to use miniExtensions[2] apps providing advanced forms to facilitate editing the

[1] www.airtable.com

[2] www.miniextensions.com

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content of the Catalogue of Solutions. In particular, miniExtensions provide functions to search, display and edit Airtable records, which are usable without being a registered user of the Airtable application. Such capability was key to (1) involve a large set of partners in the development and revision of content for the Catalogue of Solutions, and (2) involve external KI-CoP experts.

Such organization allowed the project to have two types of users for the Airtable data:

(1) A small set of core users, registered in the Airtable application, who can edit the data and tables structures directly.

(2) A much larger set of users (partners, KI-CoP) accessing and editing parts of the data through search functions and forms provided in miniExtensions. These users did not have the possibility to delete records or modify the data structure.

One main activity for the use of miniExtensions was through the process of proposing and reviewing solutions. Therefore, we have gathered information from actors that have proposed new solutions, and authors and reviewers of solutions by project members. When information for a solution was ready to be reviewed, the author notified the reviewers through e-mail, and the reviewer used the miniExtension form to provide feedback and comments on each field of the described solution (see chapter 4.4). Shown in Figure 7 from the author forms in the Mini-Extension of the solution KATWARN. The image shows the basic information, in which the reviewing actors have added comments in the review field. Only the "REVIEW" fields are editable in this form, limiting risks to mistakenly edit content.

Different forms were developed in miniExtensions for different audiences: main authors (full access to data), partner reviewers (only access to REVIEW fields created for each content field), and external experts reviewers (only access to a few global comment fields).

The research leading to these results has received funding from Horizon 2020, the European Union's Framework Programme for Research and Innovation (H2020/2014-2020) under grant agreement n° 882850.

Figure 7. Snapshot from author form in Mini-Extension.

5.2 INFORMATION SECURITY AND ETHICAL ASPECTS

The data stored on the collaborative Airtable does not contain any raw data from the interviews, but rather the abstracted and analysed data without sensitive information or personal data. Security sensitive information, as described in D8.2, was not collected and therefore not included in the catalogue. Informants providing information through interviews did so based on informed consent, following the data protection process for the project, as described in D6.1, and the applicable data protection regulations on EU and national level. Prior to representation in the CoS, information providers were allowed to provide their final acceptance of the publishing. Airtable does not collect any personal data of collaborators on the platform.

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6 CONTENT OF COS

6.1 EXAMPLES FROM COS

In this section we are going to mention some examples of the solutions presented in the catalogue of solutions. We will explain both types of solutions, the ones that are described only using the basic information and the ones that are characterised in depth.

6.1.1 BASIC INFORMATION

The examples described here follow the structure mentioned in section 3.2. The examples mentioned cover different types of solutions (apps, call centre and media) to show the diversity of the CoS. The first solution is "KATWARN" which is an app that sends public warnings to the population in case of a disaster. The application was developed in Germany by Fraunhofer FOKUS on behalf of public insurance companies in Germany (See Table 4). Another solution that builds upon technology is "RoHelp". It is a digital platform that was launched in Romania during COVID-19 time to help organisations collect resources they need (See Table 5).

Table 4. Description of "KATWARN" solution

ID: 31	**Name:** KATWARN	Type: App
Description of solution (short): The KATWARN system sends public warnings and behavioral advice in case of crisis through app and SMS. All warnings originate from government agencies responsible for safety, security organisations and control centres. These actors decide on the content, timing, and the extent of issued warnings. Examples of senders are the police, fire department control centres, the German Weather Service, as well as flood and earthquake centres and external warning systems. Examples of when such warning systems may be used in under large-scale fires, floods or others. The KATWARN system was developed by Fraunhofer FOKUS on behalf of public insurance companies in Germany.		
Purpose: Improve communication and information sharing; Enhance risk awareness; Efficient response		
Aggregated needs: Improve autonomy, coping abilities, and proactiveness of citizens; Communicate with or alert citizens		
Provider/user:	Target population/group: Civil society	
Disaster phase: During	Location: Germany	Year of launch: 2011

Table 5. Description of "RoHelp" solution

ID: 161	**Name:** RoHelp	**Type:** Web service or other digital service
Description of solution (short): RoHelp is a fully-featured digital platform which lends itself to be used by all organisations that actively are involved in halting the spread of Covid-19. The platform was developed during the Covid-19 pandemic in Romania, and its main purpose is to help organisations collect the resources they need. On the RoHelp platform various civil society organisations that are interested in helping during emergency situations		

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can register themselves. They identify the needs adapted to local context and circumstances and they collect donations via the platform in order to solve the problem. The solution allows non-governmental organisations with various fields of expertise to build bridges within their local community and increase the societal resilience. Limitation: Donors might lose their interest after the pandemic and this might affect NGOs in their way of collecting donations and solving problems at the community level.
Purpose: Facilitate resource allocation; Capitalise social networks and relationships; Efficient response
Aggregated needs: Organise and coordinate volunteers
Provider/user: NGO(s); Public authorities and policy makers Target population/group: Civil society
Disaster phase: Before; During; and After Location: Romania Year of launch: 2020

The following solutions aim at enhancing communication and information sharing between emergency responders and civil society/citizens on health-related topics. The first one "Information hotlines (Call Habriut)", is a call centre developed by the Israeli Ministry of Health; citizens use this hotline to enquire about different health topics (See Table 6). This solution is not oriented toward emergencies, it offers general information that could be used for enhancing citizens' awareness and preparation. The second solution "West Midlands Ambulance Service on Twitter", is a social media account, run by West Midlands ambulance service in the UK. The account aims at providing citizens with medical information and information related to the ambulance service itself (See Table 7).

Table 6. Description of "Call Habriut" solution

ID: 66	**Name:** Information hotlines (Call Habriut)	**Type:** Call center
Description of solution (short): Information hotline (Call Habriut) is a solution implemented by the Israeli Ministry of Health. The solution is in daily use for providing information to the citizens on different topics. The information hotline is not to be used during emergencies. Such a solution reduces the number of non-emergencies calls to the emergency line. The individuals answering calls have the relevant training to provide information and to identify emergency inquiries or calls demanding specific treatment. During the COVID-19 pandemic, this solution was used for inquiries related to COVID-19. Using this hotline, the citizens could obtain information about quarantine rules, typical symptoms, other advice and information.		
Purpose: Improve communication and information sharing; Enhance preparedness		
Aggregated needs: Communicate with or alert citizens; Improve preparedness level among citizens		
Provider/user: Emergency organisations and services	Target population/group: Civil society	
Disaster phase: During	Location: Israel	Year of launch: 2011

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Table 7. Description of "West Midlands Ambulance Service on Twitter" solution

ID: 127	**Name:** West Midlands Ambulance Service on Twitter	**Type:** Media
Description of solution (short): West Midlands Ambulance Service (WMAS) on Twitter communicates with the population through twitter posts. They provide information about regular workdays, the types of calls they receive, smaller or larger events, and any information on what has happened during the day. They also provide health information such as how to reduce the risk of heart disease, and instructions about what to do during emergencies. In times of crisis when high call volumes occur, pandemics or other major incidents, they also communicate advice to the public on Twitter. The main contribution of the solution is to inform the public about how to prepare in order to reduce the impact of a crisis and what action to take in order to reduce harm. The posts the WMAS publish regularly also contribute to build a large audience, which is beneficial during crisis when critical messages have to be dispatched to the public. A limitation with the solution is that it only reaches Twitter users, although many posts are picked up by news outlets.		
Purpose: Improve communication and information sharing; Enhance risk awareness; Improve health and mental outlook		
Aggregated needs: Communicate with or alert citizens; Improve autonomy, coping abilities, and proactiveness of citizens		
Provider/user: Emergency organisations and services	Target population/group: Civil society	
Disaster phase: Before and During	**Location:** United Kingdom	Year of launch: 2011

6.1.2 In-depth information

While in the previous sub-section we introduced some examples that are described only using basic information, here, we cover solutions that are characterized in-depth according to the attributes mentioned in section 3.2. The two solutions covered here are "Dopomoha (support platform for refugees)" and "Don't Shake at an Earthquake".

- Solution ID: 52
- **Solution name:** Don't Shake at an Earthquake
- **Description of solution (short):** The "Don't Shake At Earthquake" is an awareness campaign focusing on preparedness in case of an earthquake. The main objective of the campaign is raising awareness, informing, and preparing the public to react correctly if an earthquake occurs. The campaign consists of six videos, and each video lasts for 30 seconds. The videos are animated and show what to do if an earthquake happens and how to act in different environments, for example at work, at the mall, or in school. A couple of videos explain how you should prepare your home in case of an earthquake, and general rules of conduct.
- **Solution type:** Awareness campaigns and training
- **Purpose:** Enhance risk awareness; Enhance preparedness; Capitalise social networks and relationships

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- **Provider/user:** Emergency organisations and services; First responders
- **Target population/group:** Civil society; Students
- **Aggregated needs:** Improve autonomy, coping abilities, and proactiveness of citizens
- **Disaster phase:** Before the crisis
- Location: Romania
- Year of launch: 2016
- **Description of solution (long):** The 'Don't Shake At Earthquake' campaign is part of an ecosystem of solutions created by the Department for Emergency situations (DSU) in Romania. The DSU works at a strategical and tactical level, and this ecosystem of solutions creates synergies that enhances the general level of awareness in the population. Other solutions in the same ecosystem are the RVM-app and the Be ready caravan.

The videos of the campaign have been shown on TV channels and promoted through radio stations. In addition, the local inspectorates have provided trainings in schools. In this way, the campaign can reach different layers of society.

The main limitation of the solution is related to impact. For example. how many people follow the campaign (either on TV or social media channels, but also in schools) and to which extent they apply the information presented in order to become more prepared. To mitigate this, private companies were involved in creating the videos to make them look professional. It was important that the videos were short (30 seconds) because the audience have a short attention span. Also, it is important that the movies are concerned with providing the correct information, and professionals know how to convey information in a suitable format. Making new videos could easily be done, however, that is a cost issue.

- **Coping actions:** Information sharing to citizens
- **Added benefits:** Together with other solutions, the awareness campaign contributes to synergies that may enhance the general level of awareness in the population.
- Lessons learned:
    - **Evaluation from case:** The Romanian authorities have sent out a questionnaire to assess the different activities initiated by the government to raise awareness, and the poll shows a positive effect. However, there has not been a specific evaluation of the awareness campaign itself.
    - **Challenges:** Attention span: To be able to keep the interest of viewers, the videos must be short (30 seconds) and preferably made by professionals.
    - **Requirements:** Cost: To make the videos will require some funding and there will maybe be required to pay for TV time. And arenas to screen the videos.
- Degree of transferability: Medium

The videos are in Romanian language and needs to be translated. Making new videos could be done, however, that is a cost issue. Moreover, one should consider the areas and audiences you wish to reach with the campaign.

- Degree of modifiability: Medium

Similar videos can be made for other types of crises. However, it would require resources to make new videos.

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- Important factors for implementation:
    - Demographic characteristics: The aim of the campaign has been to reach different layers of society. The videos developed for the awareness campaign have been shown on national TV and radio. In addition, the videos have been used in the Be ready caravan and shown in schools in relation to training of first aid skills. Thus, the potential to reach the whole population is high. The response time in case of an emergency is known to be longer in rural than urban areas. In addition, skills and knowledge about preparedness are perceived to be lower in rural areas, thus the government has been particularly concerned with conveying the information to these areas.
    - Material conditions: It has been important to use professionals when making the videos, which has a cost, depending on the company used and number of videos.
    - Preparation and planning: It was important that the videos were short (30 seconds) because the audience has a short attention span. Also, it is important that the videos are concerned with providing the correct information. Private companies were involved in creating the videos to make them look professional, since professionals know how to convey information in a suitable format. It should be considered that the media used can influence acceptance by the public.
- Important factors for use/effectiveness:
    - Collaboration: In order to disseminate the videos to a broad audience, it will be important to have collaboration and agreements with for example TV channels to screen the videos, with radio stations to promote them, as well as collaboration with schools and universities to allow training sessions during school time.

The "Dopomoha" solution is described as follows in the CoS:

- Solution ID: 173
- **Solution name:** Dopomoha (support platform for refugees)
- **Description of solution (short):** Dopomoha.ro is an information and support platform for refugees who request help in Romania. The web platform named Dopomoha, which means "Care for Romania", was developed as a response to the refugee crisis during the war in Ukraine. It allows NGOs, (unorganised) volunteers, and private companies to register their available resources, such as transport, food and housing. Moreover, national and UN agencies located in Romania can access and make use of the resources to help the refugees, for example with finding safe housing. Hence, the platform is a form of inventory where resources and needs can be matched in a similar way as done in sharing economy platforms. Currently, the solution is available in English, Russian and Ukrainian. The NGO Code4Romania has developed the platform in open source-code.
- **Solution type:** Web service or other digital service
- **Purpose:** Facilitate resource allocation; Capitalise social networks and relationships; Efficient response
- **Provider/user:** Public authorities and policy makers; Civil society; Emergency organisations and services; First responders; NGO(s)

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- **Target population/group:** Citizen groups at risk; NGO(s); Organised volunteers; Emergency organisations and services; Healthcare workers; Citizens; Public authorities and policy makers
- **Aggregated needs:** Organise and coordinate volunteers; Improve involvement of and cooperation with citizens
- Disaster phase: During
- Location: Romania
- Year of launch: 2022
- **Description of solution (long):** The dopomoha.ro web platform was launched in 2022 as a response to the refugee crisis following the Ukraine war. The basis for the platform is the RVM app and its corresponding platform, launched in 2020 (see information about the RVM app i the CoS). The Dopomoha website is a portal for both providing and requesting resources. The Romanian Department of Emergency Services of the Ministry of Internal Affairs (DSU) deploys available resources.

The platform landing page displays six buttons, through which the user can navigate between the different information categories. By clicking 'Legal status', the user of the website is provided with information about protection, short stays, rights, and how to apply for asylum. 'Info' takes you to frequently asked questions and answers. 'Stay safe' gives guidelines to refugees on how to avoid human trafficking and exploitation. 'Support' takes you to a page with different options. If you are a refugee, you are here provided with information about for example how to request financial assistance, where to ask for medical assistance, and you can register your need for housing, legal help, and transport. In addition, 'Support' is directed to volunteers who wants to help, and provides a way to register help with food, products, clothing, or transportation. With the fifth button, 'Housing', the user of the website is provided with two options - you can either ask for accomodation, or you can offer accomodation. The last button, 'Call centre', takes you to a page with an overview of help lines and telephone numbers to medical support.

When it comes to resources that are offered, such as transport and housing, everything is checked and verified, both the people providing help and what they offer as resources. In the beginning of the war, housing was a priority and legal aspects was a significant aspect. The DSU can view all the housings (all have been verified) and can follow up on refugees to see where they are and that they are safe. Refugees are offered public spaces first, such as hotels. When public spaces are full, refugees have been allocated to private homes.

- Coping actions:
    - Aligning and sharing the resources of different emergency organisations; Collaboration between different emergency organizations,
    - Collecting clothes, foods and other vital resources,
    - Information sharing to citizens,
    - Providing food,
    - Transport of people, material, equipment,
    - Health care assistance,
    - Information sharing between populations affected by crises and emergency organisations and authorities,
    - Psychological and psychosocial aid

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- **Added benefits:** In Romania, there was not a proper digital infrastructure at the time when work with the RVM app began. Code 4 Romania filled this gap by developing the app that works in areas without connection. Moreover, one can foresee other benefits by using this technology. For example, infrastructure for sustainability (sharing resources), and circular economy.
- Lessons learned:
    - **Evaluation from case:** Since 2020, NGOs have been uploading data in the RVM app to be used by the Department of Emergency Services (DSU). Information from Chief Security Officers and other users of the app was being gathered in order to release a 2.0. version of the RVM app. In the meantime, the Ukraine war began, and the refugee crisis was a fact. In this situation, there was a need to gather and collect all available resources from private companies and (unorganised) volunteers, not only NGOs. Thus, further development of the original RVM platform was needed. The urgency of the Ukraine war necessitated a separate development to handle requests outside NGOs, however the databases need to communicate with each other. Two new modules were released within less than two weeks. There is now one unique access point for all involved parties (NGOs, public authority, citizens).
    - Feedback from users: The functionality of the platform has been continuously evaluated through feedback from users. Feedback has been given from the ground workers to the DSU of what the needs are, for example now there is a need for clothes and medicines. Feedback has also been related to the need to diversify and how to integrate new features. for example, a separate category for tents is needed, not only the category "housing".
    - Challenges:
        - Tech support: A team with tech support for using the app work 24/7 answering telephone and providing support via Microsoft Teams has been established. Some users will always have challenges using such a platform, even though developers always pay attention to accessibility and work with the least technically savvy people as a point of departure.
        - GDPR: The Department of Emergency Services wanted to identify volunteers and know who they are, not only see the number of volunteers in an NGO. One person could be part of several organisations, and it would look like you have 30 volunteers, but it might be the same persons. However, identification of individuals is personal data. This was solved by letting only emergency police at state level see the volunteers available. The management of personal data will be done by the organisations themselves, including registering volunteers.
        - Security: There has been challenges with people offering resources who do not have the best of intentions. Developers have added a location interface consisting of a very long page of terms and conditions. This is done in an attempt to discourage such people. This feature might be bypassed, but regular citizens would be discouraged by it. Moreover, the Dopomoha platform has a dedicated site with guidelines for how to stay safe and emergency numbers, which is easily accessible from the Dopomoha landing page.

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        - Discrimination: There have been some unfortunate events related to discrimination, for example people with dark skin who has not been allowed housing while standing on the doorstep of the house.
    - Requirements:
        - Tech skills: A team of skilled developers, covering different competencies needs to be in place. This includes a tech support team, UX competence to have the least technically savvy people as a point of departure, designers that are working on preparing the apps and prototyping. Most of the work, approximately 80 per cent, is research and prototyping.
        - Collaboration between government and NGOs: There needs to be a well-functioning collaboration between authorities and NGOs in order to organise and coordinate all the requests and people who offers to help. In Romania, they have created a physical centre, the National Centre for Intervention, Coordination and management (CNCI), which is under the umbrella of the Department for Emergency Situations (DSU) through the Inspector General Inspectorate for Emergency situation. The centre is coordinated by the DSU. In this centre, coordination cells may be activated, such as the operational coordination cell, the civil society coordination cell, and the international coordination cell. When the war in Ukraine broke out, the activated cells started out with 1-2 people and increased in number during the first days depending on the situation.
        - Communication channels: On the second or third day of the Ukraine war, a temporary WhatsApp group was set up in order for the NGOs to get first-hand information from an official source. In a few days' time, representatives from over 200 structures and approximately 250 people were in the WhatsApp group. To establish a more permanent solution, the Association of the Software developers in Romania was contacted, and through them contact was made with Microsoft, which provided 1000 licenses to set up a communication and coordination ecosystem by using Microsoft Teams.
        - Marketing: One might consider the need for marketing of such a platform. If the goal is to gather and register as much resources as possible, marketing the platform can make it more known. In addition, more resources will likely be available in different regions. Note that you can arrive at the point of having too many resources that it is challenging to keep an overview and verify every person and resource.
- Degree of transferability: High

All code written by the Code for Romania community is open source, thus the software code underlying the app and web platform is transferable to other countries. Note, however, the need for close collaboration between government and NGOs.

- Degree of modifiability: High

All code written by the Code for Romania community is open source, thus the software code underlying the app and web platform is easy to modify to other types of use.

- Important factors for implementation:

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- Digital literacy: All requests and offers, in addition to communication, are done through web platforms or other types of digital systems. Accordingly, there needs to be a certain degree of digital literacy in order to make use of the platform.
- Collaboration: Close collaboration between government and NGOs is needed, and communication channels with the possibility of involving up to 1000 members needs to be established.
- Marketing: To increase the awareness of the platform and geographical coverage, it may be in order to spend some resources to plan marketing efforts. This will depend on the outreach possibilities of the solution provider in question and the need for marketing. If broader segments of the public are familiar with the platform, it will likely increase the platform's resources in handling different crises.

- Important factors for use/effectiveness:
  - Collaboration: There needs to be a well-functioning collaboration between authorities and NGOs in order to organise and coordinate all the requests and people who offers to help.
  - Digital literacy: All requests and offers, in addition to communication, are done through web platforms or other types of digital systems. Therefore, the use of the platform requires a certain degree of digital literacy. At the same time, the Dopomoha platform has been developed with the user in mind, making it intuitive and easy to use.
  - Marketing: In order to increase the awareness of the platform among citizens and other target groups (i.e., here refugees), marketing activities can make the platform more visible and effective.

6.2 CONTENT STATISTICS

In this section we present some statistics about the solutions in the CoS. The solutions were collected using different methods such as workshops and interviews with the end-users, revision of the literature and case studies (please see D2.2 for further information about the data collection process). The various sources resulted in different maturity levels of the solutions, for example, we have implemented, planned and proposed solutions. Further, the collected solutions went through a filtration process, resulting on some of them to be excluded from the catalogue, others to be considered as ideas, others for in-depth characterization (please refer to deliverables D2.5 and D3.1 for further information about this process, Labaka et al. 2023, Aalberg et al. 2021).

Table 8 illustrates how the collected solutions are distributed across these different maturity levels. Specifically, our dataset comprises a total of 215 solutions, with 153 of them already implemented, 60 in the proposed stage, and 2 in the planning phase. However, for the Knowledge Platform within the CoS, our focus centres on solutions that are both implemented and have complete basic information or have undergone in-depth characterization. This selection criteria narrows down our dataset to 100 solutions, which we will use for reporting statistics in the subsequent subsections.

It's worth noting that the catalogue of solutions is dynamic and subject to changes based on feedback from end-users and recommendations from the KI-CoP's. Therefore, the analysis presented here is based on the available list as of September 12th, 2023.

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Table 8. Distribution of solutions across different maturity levels and the associated review/filtration status

Status used for solutions throughout the review process								
Maturity level	Basic info completed	Ideas bank material	In progress of in-depth characterization	Ready for publish	Ready for Review	To be considered	To be excluded from catalogue	Total
Implemented	1	2	3	70	27	10	40	153
Planned		1				1		2
Proposed		40			1	2	17	60
Total	1	43	3	70	28	13	57	215

6.2.1 SOLUTION TYPE

As mentioned in section 3.2, in the CoS there are different categories or types of solutions where each solution can fit in. Figure 8 shows the number of solutions per each type. Application is the category including the highest number of solutions. While categories such as "Awareness campaigns and training", "Web service or other digital service", "Guidelines and plans" have almost the same number of solutions assigned to them; 16, 15, and 15 respectively. There is one solution that was assigned to two different categories "Awareness campaigns and training" and "Inclusive or psychological support", which is solution number 215 "Brannbamsen Bjørnis (Firefighter Teddy Bear Bjørnis)".

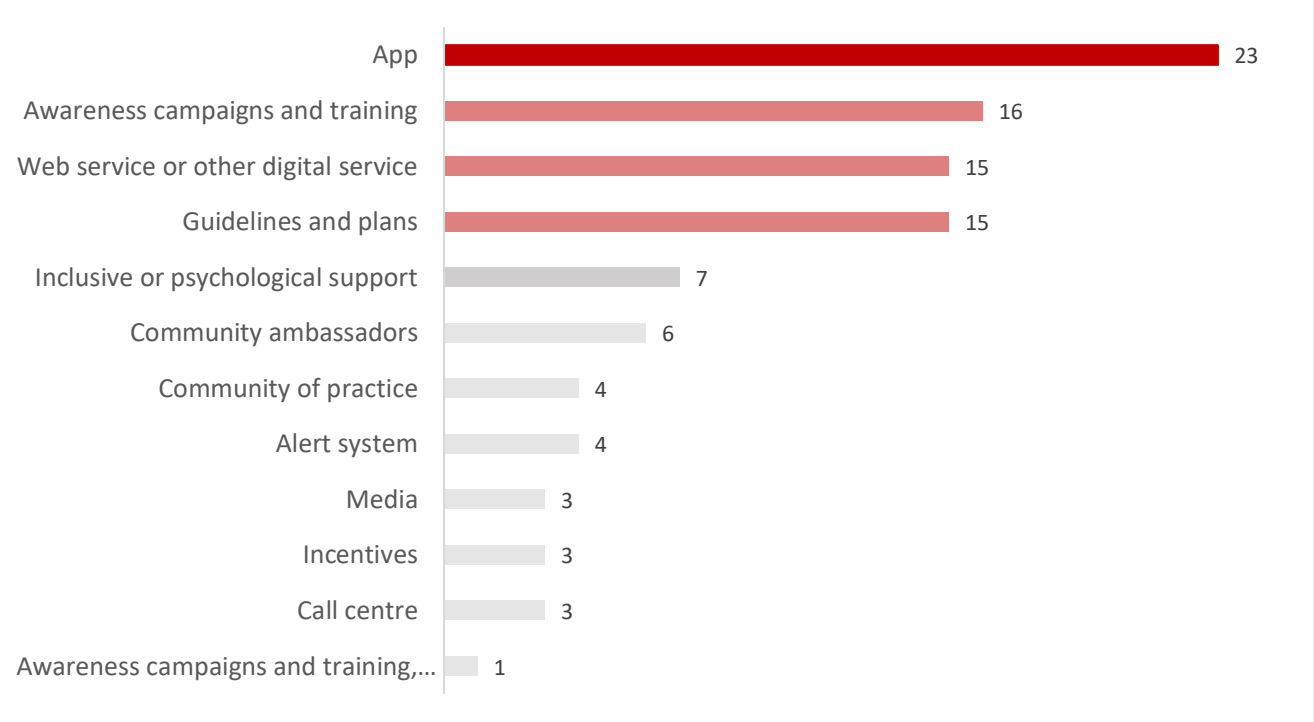

Figure 8. Number of solutions per solution type

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6.2.2 PURPOSE

Figure 9 presents the assignment of the solutions across the nine identified purposes. Each solution could be attached to multiple purposes. The number of solutions aiming at "Enhancing preparedness" or "Improving communication and information sharing" or "Enhancing risk awareness" or "Efficient response" surpass other purposes such as "Quick recovery" and "Empowering citizens in governance and leadership".

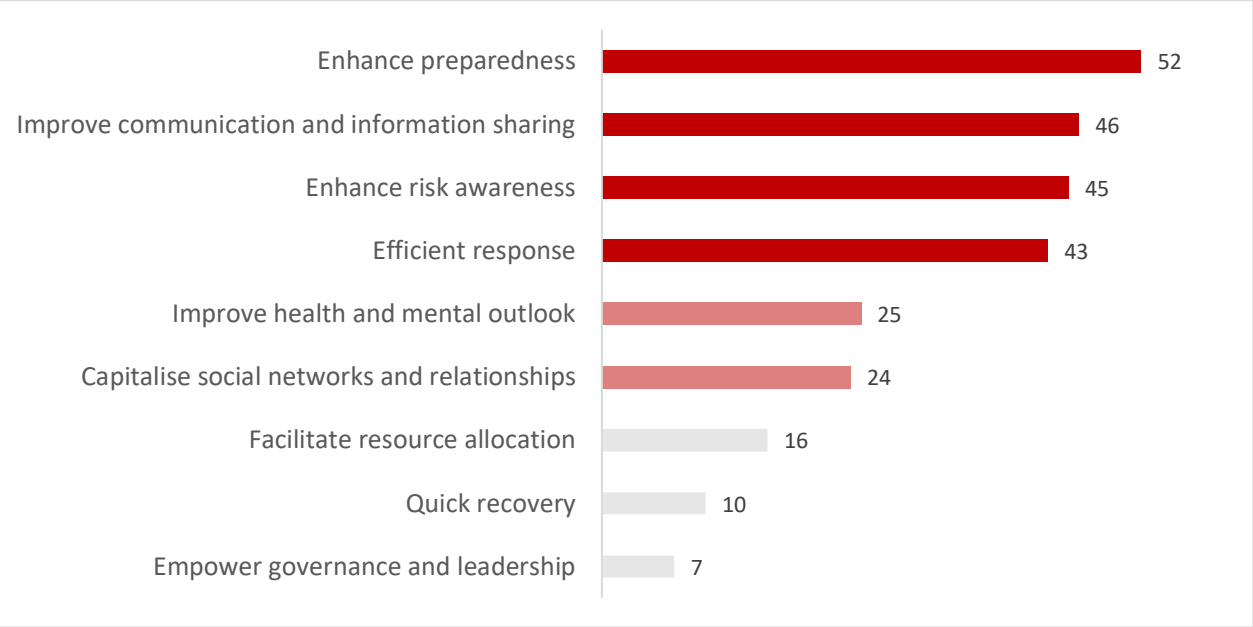

Figure 9. Number of solutions assigned to each purpose

6.2.3 SOLUTION PROVIDER/USER

Investigating the solution providers, we found that the majority of the solutions are provided by either public authorities or emergency organizations. Which aligns with the aim of ENGAGE of enhancing resilience through enhancing the interactions among emergency organizations and authorities on one side and civilians on the other side. See Figure 10.

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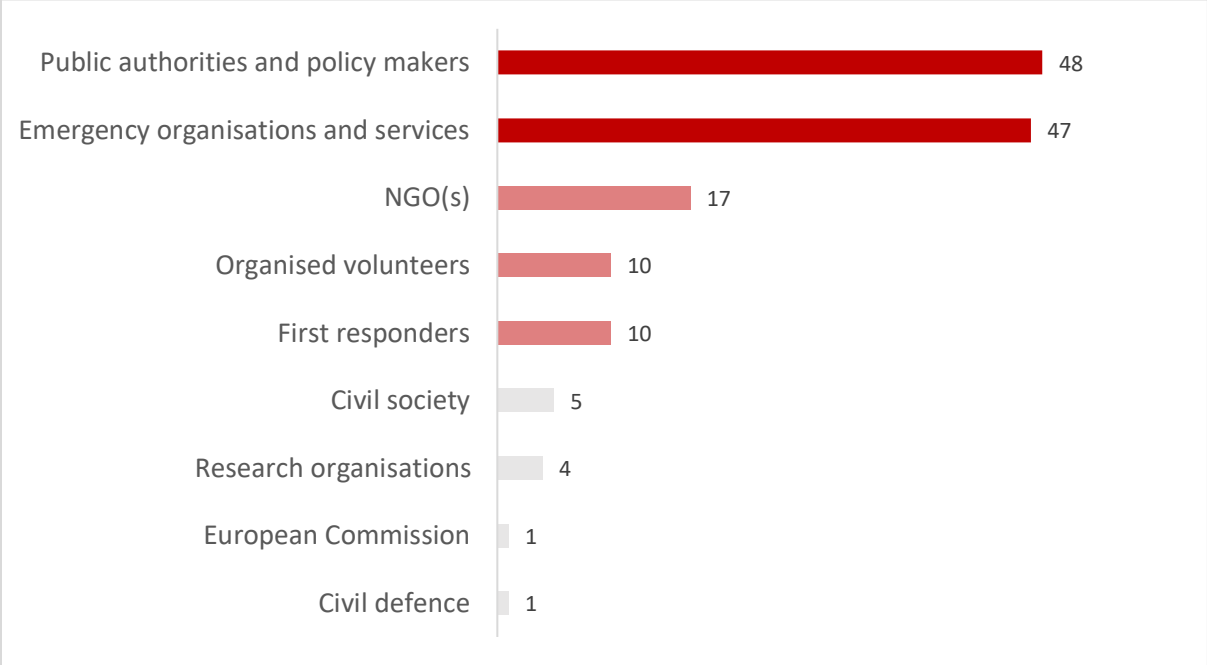

Figure 10. Number of solutions provided/used by a specific entity

6.2.4 TARGET POPULATION

On the other hand, if we consider the target population, we find that more than 50% of the solutions are targeting civil society. Very few solutions are targeting ultra specific groups, such as radicalized and violent individuals and spiritual leaders. See Figure 11 for the distribution of the solutions among the different target groups.

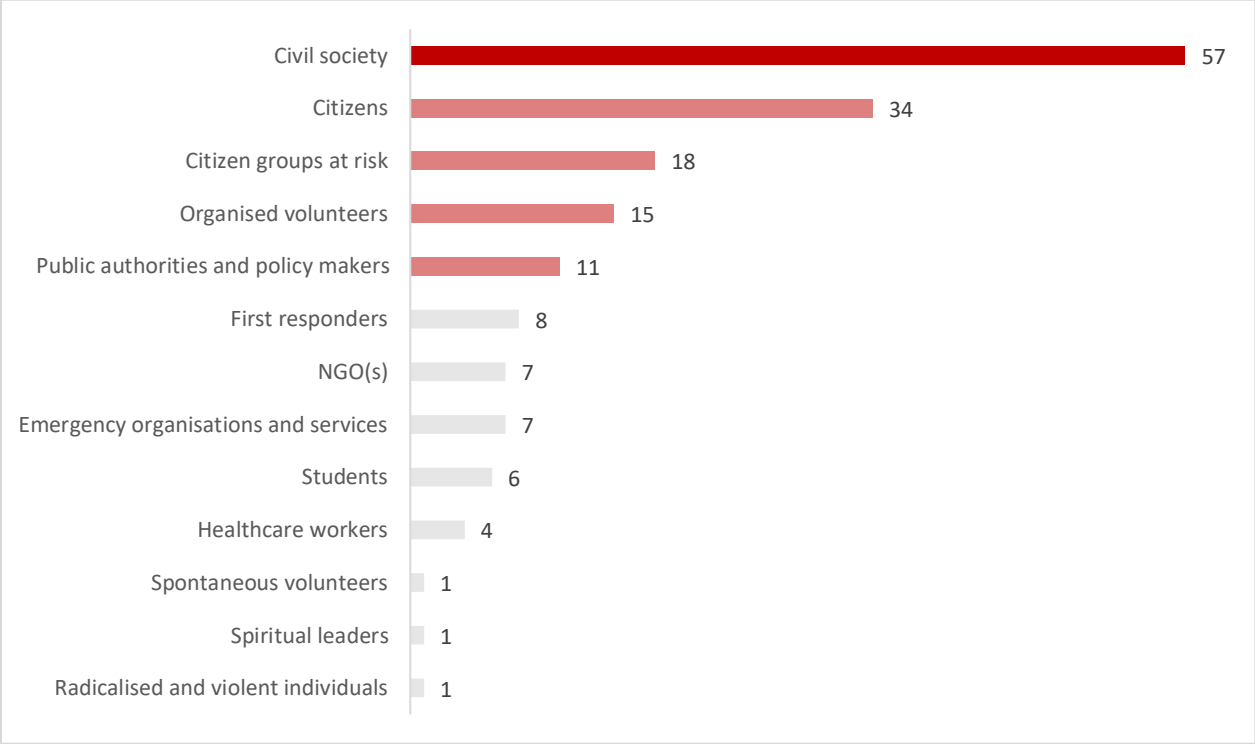

Figure 11. Number of solutions targeted towards a specific group

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6.2.5 SUPPORT TO FIRST RESPONDERS

Regarding the needs of first responders, we found that the majority of the solutions help the first responders communicate or alert the citizens. While few solutions are oriented toward involvement and collaboration with the citizens, as shown in Figure 12.

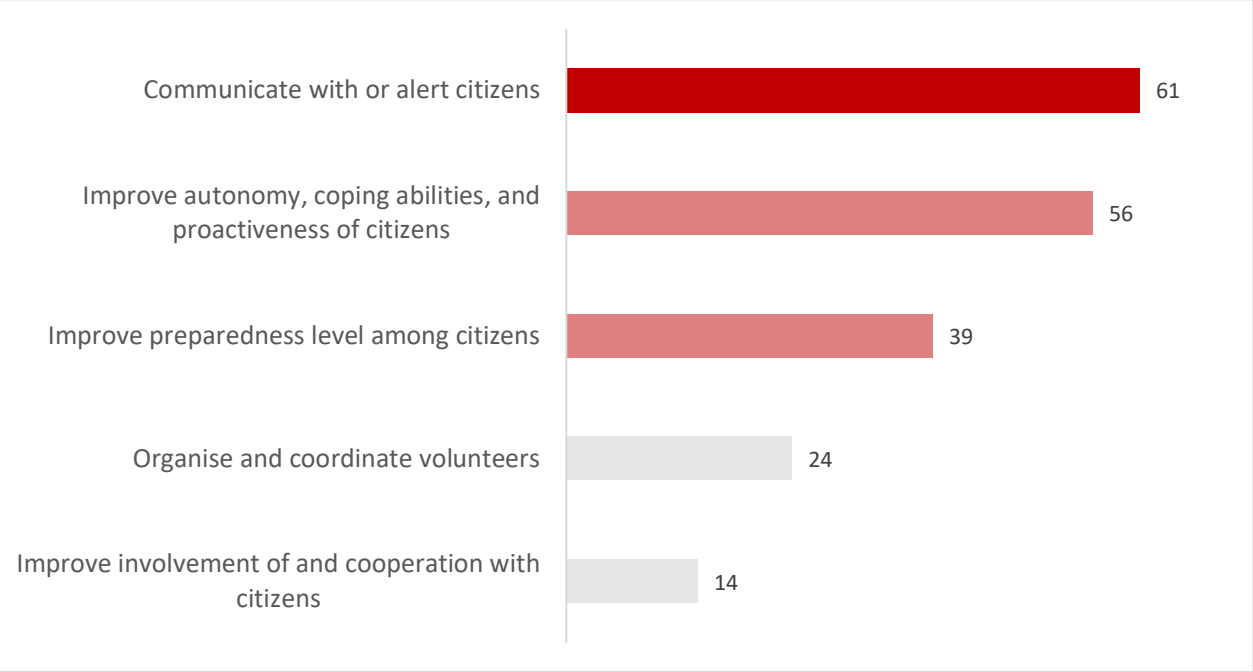

Figure 12. Number of solutions assigned to each need

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7 CONTEXTUAL FACTORS

7.1 BACKGROUND AND PURPOSE

Contextual factors are conditions that influence the ability of a society to cope with adverse situations. Contextual factors may be barriers or enablers for the adoption of societal resilience solutions. It is important to identify the contextual factors and understand their impact on solutions because this knowledge serves as a basis for defining guidelines about how solutions can be adopted.

A categorization of contextual factors was developed in WP1 based on a literature study and the study of cases. Also, WP3 has contributed to new categories identified through the in-depth characterization of solutions in WP3. WP1 also proposed to classify the factors in five groups:

- Situational factors refer to conditions that enable immediate coping actions during an adverse situation. For example, these include propinquity, threat perception and level of alert and preparedness.
- Individual background refers to conditions that explain coping actions with individual capacities, social positions and beliefs. For example, the group includes religiosity, coping skills, level of trust in others, gender and disabilities.
- Local environment refers conditions that structure coping actions on a local level. For example, the group includes communality and topography.
- Society refers to conditions related to the structure of society. For example, the group include socio-economic conditions, demographic characteristics and cultural conditions.

The classification is not mutually exclusive, i.e., a concrete factor influencing the use of a solution may relate to several categories in those groups.

The adoption process of a solution consists of two main phases: the implementation of the solution and the use of a solution. The implementation covers various activities such as acquisition, adaptation, promotion, distribution, or deployment. The use relates to the actual utilization of the solutions by the target users. In the in-depth analysis of the solutions in WP3, we therefore distinguish between:

- Contextual factors important for implementation, i.e., conditions that have shown to influence the implementation of the solutions. The adopters of solutions should keep in mind that some conditions may make difficult the implementation of a solution. For example, cultural conditions may influence the motivation for adopting a solution.
- Contextual factors important for use, i.e., conditions that have shown to influence the use of the solutions. For example, coping skills may influence how well a solution is being used.

Through understanding the factors that impact on the implementation or the use of a solution, it is possible to define actions for either strengthening enabling factors or avoiding barriers. For example, to reduce motivation barriers related to cultural conditions, communication campaigns may be conducted that change attitudes; access to training may be considered to strengthen necessary coping skills for using a solution.

In the following we describe the contextual factors for the 25 solutions that were characterized in depth in WP3. For each factor, based form the experience of implementing and using the solution, we present the barriers of enablers that were observed. This information was

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identified from the analysis of the data collected in the in-depth study, i.e., documents and interviews. We present contextual factors important for implementation and those important for use separately. Some factors have impact on multiple solutions, some on few. We therefore provide a short summary. Providing concrete guidelines for the implementation and use of a specific solution is challenging as many factors may have impact on implementation and use. Also, many paths may be considered to avoid barriers or strengthen enablers, and they should be assessed with respect to specific needs. Therefore, our summaries should be understood as support for developing guidelines.

7.2 FACTORS INFLUENCING IMPLEMENTATION AND USE

The contextual factors are described in Table 9. This list of factors was used during analysis for describing factors that are important for implementation and for use.

Table 9. List of contextual factors

Situational factors: Conditions that enable immediate coping actions during an adverse situation. These include propinquity, threat perception and level of alert and preparedness.
• Propinquity: Propinquity refers to proximity to the event. It might be proximity in time and space, or the emotional affinity to the event. • Threat perception: Threat perception refers to the perception of likelihood, severity and intrusiveness in an adverse situation. Intrusiveness encompasses that the persons targeted by the solutions experience themselves the threat. • Risk awareness: Recognition of the potential for hazards, risks and incidents that may occur. • Perception of response: Understanding of the measures for reducing or eliminating risks. • Perception of responsibility: Sense of individual or collective responsibility to prepare or act in case of a crisis. • Level of alert and preparedness: Extent in which individuals and social groups are prepared to understand risks and to be willing and capable to respond to the event in a particular crisis. This relates to the sense of preparedness and the actual preparedness, access to training, preparation and planning, organisation's willingness to participate in the exercise and the response capacities of the organizations involved in the exercise. • Sense of preparedness: Organization's or individual's state of readiness and the belief that they are adequately equipped to effectively respond to and navigate through a crisis. • Actual preparedness: Actual state of being ready for an adverse event to happen.
Individual background: Conditions that explain coping actions with individual capacities, social positions and beliefs. These include religiosity, coping skills, level of trust in others, family status, socio-economic status, gender and disabilities.
• Beliefs: All forms of convictions that enable action. For example, political and religious beliefs. This also includes the perception of responsibility based on the idea that

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perception of responsibility cannot be dissociated from the way actors make sense of a situation based on their beliefs.

- Coping skills: All the relevant skills for engaging in efficient coping actions. For instance, digital literacy.
- Digital literacy: Capacity to find, evaluate, and communicate information by utilizing typing or digital media platforms.
- Access to training: Access to educators, pedagogical material and the corresponding resources to provide training.
- Level of trust: Level of trust in other individuals or social groups.
- Family status: Size of household and number of children.
- Socio-economic status: Combination of individual level of education, income and occupation.
- Gender: Socially constructed roles, behaviours, expressions and identities of girls, women, boys, men, and gender diverse people.
- Disabilities: A physical, mental, cognitive, or developmental condition that impairs, interferes with, or limits a person's ability to engage in certain tasks or actions or participate in typical daily activities and interactions.

Local environment: Conditions that structure coping actions on a local level. These include communality and topography.

- Social bonds: Degree to which an individual is integrated into the society.
- Communality: Strength of social bonds and the extend of social networks in a community.
- Size of the community: Population density or number of individuals within a community.
- Geography: Physical, biological, and cultural features of an area. Topography is an aspect of geography.
- Topography: Physical access or possibility to evacuate the crisis affected area.

Society Conditions that enable coping actions and that refer to the structure of society. These include socio-economic conditions, demographic characteristics and cultural conditions.

- Socio-economic conditions: A combination of collective level of education, wealth and access to resources. This also includes material conditions.
- Material conditions: Concrete aspects and resources primarily associated with economic and physical factors that influence their well-being, opportunities, and overall quality of life of social groups or society as a whole.
- Demographic characteristics: Demographic characteristics of the affected population, such as age and ethnicity.
- Age of the population: Relative age of a target population or social group.

Organisational context: Aspects related to the way the actors involved in crisis management are organised and behave. These include the management structure, the relationship between actors (e.g., NGOs, first responders and authorities), the collaboration

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capabilities, the organisation's sense of responsibility, the level of informality and internal backing.

- Management: Management is related to the solution, not to the wider scope of crisis management. Management is about planning and organising the solution, allocating resources to it and following up its deployment and use.
- Internal backing: Support from the leadership and employees within the organisation to the solution and to the anchorage of the solution in the organisation strategy.
- Mental support: Support that people receive to protect their mental health.
- Collaboration: Process by which individuals or groups from different organizations work together to achieve common goals or objectives.
- Relationship between NGO and first responders and authorities: Ability of these key organisations in a crisis to collaborate and coordinate effort.
- Marketing: Means and resources to promote a solution.
- Preparation and planning: Process of creating a roadmap for implementing and using a solution. For example, it includes allocating resources, and anticipating potential barriers and defining contingency plans. It also relates to the relation between a solution and existing disaster or crisis planning.
- Organization's willingness to participate in an exercise: Motivation and commitment of the organisation to contribute to an exercise.
- Organisation's sense of responsibility: Organisation's recognition of the obligation it has toward various stakeholders.
- Response capacities in an exercise: Abilities and resources of organisations to take measures to successfully participate to the exercise.

7.3 Overview for the in-depth characterised solutions

As explained in section 4.3, 25 solutions were selected for in-depth characterisation. These solutions and their short descriptions are presented in Table 10. We have also chosen to indicate the type of solution seeking to identify whether some factors have more impact on specific types of solutions. We assign a colour code to each type of solution, that will be used throughout the section.

Table 11 and Table 12provide an overview of the factors that have impact on, respectively, the implementation and use. We observe that *collaboration* (between organisations in crisis management) is a factor that often has an impact, both for use and implementation, and that *perception of responsibility* is a factor that has an impact for the use of many solutions. Unsurprisingly, *digital literacy* is important for solution of types "app" and "web service", while *communality* has impact on solution of type "community ambassador". More details on the nature of the impact are described in sections 7.4-7.8 for each factor.

Table 10. Overview of the solutions and their descriptions classified by solution type

Solution type	Name	Description
App	Basque police App (Ertzaintza app)	The solution enables citizens to have direct contact with the police agency and provides multiple channels to facilitate

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		communication (i.e., mobile, email, WhatsApp, SMS, and direct contact with the emergency number).
	My112	My112 is an app allowing citizen in distress to communicate with the 112 Emergency Centre.
	HartslagNu (HeartbeatNow)	HartslagNu is an app that notifies civilian first responders if a sudden out-of-hospital circulatory arrest (OHCA) occurs close to their location. The HartslagNu users, i.e., the civilian first responders, closest to the incident get a request to help. The aim is to reduce the response time to start cardiopulmonary resuscitation (CPR).
	TrygFonden Hjerteløber (Heartrunner)	TrygFonden Hjerteløber is an app that notifies citizen responders if a sudden out-of-hospital circulatory arrest (OHCA) occurs close to their location, so they can start cardiopulmonary resuscitation (CPR) as quickly as possible before the arrival of the ambulance and paramedics.
	City Connect	City Connect is an application used by municipalities to distribute critical information to the citizens, such as requests or other types of information in relation to different types of events. Citizens may also use the app to distribute messages to the municipalities.
Web service or other digital service	Crisis information website	Crisis Information (krisinformation.se) is a website providing information from the Swedish authorities to the citizens during crises and emergency situations.
	Petabencana	PetaBencana.id is an Indonesian web platform that crowdsources social media data to map floods and other disasters in real-time, enabling residents and government agencies to spread information to the public.
	Dopomoha (support platform for refugees)	Dopomoha.ro is an information and support platform for refugees who request help in Romania. It allows NGOs, (unorganised) volunteers, and private companies to register their available resources, such as transport, food and housing.
Awareness campaigns and training	30days30ways	30days30ways is a national campaign of preparedness activities for citizens via social media.
	School training campaigns	These campaigns aim at teaching the children and young people about different safety measures in order to prevent an accident and know how to deal with a crisis when it occurs.
	Don't Shake at Earthquake	The "Don't Shake At Earthquake" is an awareness campaign focusing on preparedness in case of an earthquake. The campaign consists of six videos, and each video lasts for 30 seconds.
	Be Ready Caravan	The Be Ready Caravan is designed as a mobile training centre, built on the structure of a truck. The purpose of the caravan is to raise awareness in the population about what

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		to do in case of an emergency, and particularly an earthquake.
	The Communities Advancing Resilience Toolkit (CART)	The Communities Advancing Resilience Toolkit (CART) is a theory-based and evidence-informed community intervention designed to enhance community resilience by bringing stakeholders together to address community issues in a process that includes assessment, feedback, planning, and action.
	EU Modex	EU Modex is a simulation exercise promoting a well-coordinated joint response to disasters. A joint approach further helps to pool the expertise and capacities of first responders, avoids duplication of relief efforts, and ensures that assistance meets the needs of those affected.
	Red Cross Preparedness guard	The preparedness guard system is a method and process for a non-governmental organisation (the Red Cross) to organise volunteer efforts in local communities during emergency situations.
Community ambassadors	The community emergency and resilience team (CERT)	Local communities establish "Community emergency & resilience teams" (CERTs). These are groups of volunteers that receive basic training to intervene and aid during varied emergencies, as well as be used in routine to raise risk awareness, and assist in the reconstruction phase following a disaster.
	Civil Guard	The Civil Guard is a volunteer organisation in Israel consisting of citizens that assist in daily police work.
	Community opinion leaders	"Community opinion leaders" is a solution on the national or community level, that uses opinion leaders to spread information, as an attempt to influence people.
Media	VOST (Virtual Operations Support Teams)	Virtual Operations Support Teams (VOST) applied to emergency management and disaster recovery is an effort to make use of new communication technologies and social media tools by relying on volunteers.
	Social media strategy for scientific communication	The social media strategy was developed by the Norwegian Institute of Public Health (NIPH) to streamline the activity and appearance of the institute on social media.
Guidelines and plans	The Enabling Social Action Programme	This programme presents guidance and recommendations for the public sector to enable and foster social action. Social actions refer to people investing their time and other resources to help the community and provide to the common good.
Alert system	Ro-Alert system	The Ro-Alert system is used to send Cell Broadcast messages to warn and alert citizens in case of emergency. The system is used in severe situations, in which citizens' lives and health conditions are endangered.

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	Everbridge Public Warning	Everbridge Public Warning Center is a Smart Hybrid Public Warning alerting for the management of critical events. It combines Cell Broadcast and Location-based SMS alert messages, and provides full support for multi-channel alerting.
Call centre	Norwegian Index for Medical Emergency Assistance	The Norwegian Index for Emergency Medical Assistance is an index for people answering emergency calls. It is a compilation of questions that is asked while people on the accident site are waiting for the emergency response teams to appear.
	European Emergency Number	European Emergency Number is a Pan-European emergency number for all citizens in Europe and visitors to European countries. By dialing 112, callers can reach emergency services such as ambulance, fire and rescue, and the police.

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Table 11. Overview of the factors important for implementation of the solutions

Factors	Basque police App (Ertzaintza app)	My112	Hartslagu (HeartBeatNow)	TrygFonden Hjertetøber (Heartrunner)	City Connect (in Hebrew)	Crisis information website	PetaBencana.id	Dopomoha (support for refugees)	30days30ways	School training campaigns	Don't Shake at an Earthquake	Be Ready Caravan	The Communities Advancing Resilience Toolkit	EU Mode Exercises (EU MODEX)	Red Cross Preparedness Guard	The community emergency and resilience team	Civil Guard	Community opinion leaders	VOST (Virtual Operations Support Teams)	Social media strategy for scientific communication	The Enabling Social Action Programme	Ro-Alert System	Everbridge Public Warning	Norwegian Index for Medical Emergency Assistance	European Emergency Number
Situational factors																									
Propinquity - Spatial and temporal proximity																									
Threat perception				x														x							
Risk awareness			x	x														x							
Perception of responsibility	x			x											x						x				
Level of alert and preparedness			x	x														x							
Sense of preparedness																		x							
Actual preparedness																		x							
Individual background																									
Beliefs					x													x							
Religiosity																		x							
Coping skills			x	x											x			x							
Digital literacy	x	x			x	x	x	x	x									x	x			x	x		
Access to training				x													x			x					
Level of trust						x							x					x	x						
Family status																		x							
Socio-economic status				x	x													x							

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Factors	Basque police App (Ertzaintza app)	My112	Hartslagu (HeartBeatNow)	TrygFonden Hjertetøber (Heartrunner)	City Connect (in Hebrew)	Crisis information website	PetaBencana.id	Dopomoha (support for refugees)	30days30ways	School training campaigns	Don't Shake at an Earthquake	Be Ready Caravan	The Communities Advancing Resilience Toolkit	EU Mode Exercises (EU MODEX)	Red Cross Preparedness Guard	The community emergency and resilience team	Civil Guard	Community opinion leaders	VOST (Virtual Operations Support Teams)	Social media strategy for scientific communication	The Enabling Social Action Programme	Ro-Alert System	Everbridge Public Warning	Norwegian Index for Medical Emergency Assistance	European Emergency Number
Gender															x			x							
Disabilities																									
Local environment																									
Communality																x	x	x			x				
Social bonds																		x			x				
Size of the community															x			x							
Topography																									
Geography												x										x	x		
Society																									
Cultural conditions																	x	x							
Socio-economic conditions				x												x	x			x					
Material conditions			x	x							x	x			x					x		x			
Demographic characteristics											x	x				x		x							
Age of the population									x	x					x			x							
Organisational context																									
Management					x										x										
Internal backing																				x				x	
Mental support																									
Collaboration			x	x				x				x					x	x			x	x			x
Relationship between NGO and															x										

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Factors	Basque police App (Ertzaintza app)	My112	Hartslagu (HeartBeatNow)	TrygFonden Hjertetøber (Heartrunner)	City Connect (in Hebrew)	Crisis information website	PetaBencana.id	Dopomoha (support for refugees)	30days30ways	School training campaigns	Don't Shake at an Earthquake	Be Ready Caravan	The Communities Advancing Resilience Toolkit	EU Mode Exercises (EU MODEX)	Red Cross Preparedness Guard	The community emergency and resilience team	Civil Guard	Community opinion leaders	VOST (Virtual Operations Support Teams)	Social media strategy for scientific communication	The Enabling Social Action Programme	Ro-Alert System	Everbridge Public Warning	Norwegian Index for Medical Emergency Assistance	European Emergency Number
first responder and authority																									
Marketing			x	x	x			x		x															
Preparation and planning											x	x										x			
Organisation's willingness to participate in the exercise					x					x				x											
Organisation’s sense of responsibility					x									x											
Response capacities of the organizations involved in the exercise																									

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Table 12. Overview of the factors important for the use of the solutions

Factors	Basque police App (Ertzaintza app)	My112	Hartslagu (HeartBeatNow)	TrygFonden Hjertetøber (Heartrunner)	City Connect (in Hebrew)	Crisis information website	PetaBencana.id	Dopomoha (support for refugees)	30days30ways	School training campaigns	Don't Shake at an Earthquake	Be Ready Caravan	The Communities Advancing Resilience Toolkit	EU Mode Exercises (EU MODEX)	Red Cross Preparedness Guard	The community emergency and resilience team	Civil Guard	Community opinion leaders	VOST (Virtual Operations Support Teams)	Social media strategy for scientific communication	The Enabling Social Action Programme	Ro-Alert System	Everbridge Public Warning	Norwegian Index for Medical Emergency Assistance	European Emergency Number
Situational factors																									
Propinquity - Spatial and temporal proximity			x	x											x										
Threat perception													x												
Risk awareness		x			x					x			x												x
Perception of responsibility	x								x			x	x		x					x					x
Level of alert and preparedness					x																				x
Sense of preparedness					x							x	x												
Actual preparedness			x												x			x		x					
Individual background																									
Beliefs																		x							
Religiosity					x																				
Coping skills																	x	x						x	
Digital literacy	x			x	x			x										x	x			x	x		
Access to training																	x							x	
Level of trust	x	x			x					x					x		x		x	x		x	x		x
Family status																									
Socio-economic status	x				x																				

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Gender					x												x								
Disabilities																						x			
Local environment																									
Communality			x	x												x	x	x		x					
Social bonds					x										x										
Size of the community					x													x							
Topography															x			x							
Geography																		x				x	x		
Society																									
Cultural conditions				x	x				x																
Socio-economic conditions	x			x																					
Material conditions																				x					
Demographic characteristics					x											x	x						x		
Age of the population	x				x																				
Organisational context																									
Management																					x				
Internal backing																		x							
Mental support			x	x																					
Collaboration					x		x	x			x						x	x							
Relationship between NGO and first responder and authority																		x							
Marketing									x	x															
Preparation and planning			x										x									x	x		
Organisation's willingness to participate in the exercise																									

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Organisation's sense of responsibility																								
Response capacities of the organizations involved in the exercise														x										

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7.4 IMPACT OF CONTEXTUAL FACTORS ON THE IMPLEMENTATION OR USE OF SOLUTIONS

The following analyses are based on the full table available in Appendix 11.7. For the definition of all factors, please refer to **Error! Reference source not found.** above.

7.4.1 SITUATIONAL FACTORS

- Propinquity - Spatial and temporal proximity

USE: When actions aim at providing support on the crisis location rapidly, spatial and temporal proximity is important for their well-functioning. Also lack of proximity may prevent some actions to be implement in an efficient way. In the case of the solutions characterized in depth in ENGAGE, spatial and temporal proximity is not mentioned to have impact on the implementation of solutions. However, defining the size of the area in which a solution can be effectively used and identifying alternative solutions for inadequate area sizes may be relevant during the implementation.

- Threat perception

IMPLEMENTATION: Threat perception may have impact on the motivation of citizens to contribute to help or follow guidance in a crisis, as well as on the effectiveness of using a solution. Therefore, to facilitate the adoption of solutions, it is important to make citizens understand threats.

- Risk awareness

IMPLEMENTATION: The concept of risk awareness is close to that of threat perception, and we observe that in both cases, the factor has impact on the implementation of the same solutions where citizens are expected to contribute to help or follow guidance. While threat perception is closer to the persons targeted by the solutions, understanding feeling threatened requires understanding the risks.

USE: Differently from the impact on implementation, we observe that risk awareness has impact on the use of more solutions than threat perception. Several of the solutions relate to risks that may not directly affect the users and that require a lower level of their participation. However, their well-functioning requires a broad participation.

- Perception of responsibility

IMPLEMENTATION: Perception of responsibility, either individual responsibility or organizational responsibility, may have impact on the motivation of citizens or volunteers to take in use a solution and participate into actions. Good communication strategies are needed to increase the perception of responsibilities.

USE: Two solutions, 30days30ways and "Be ready caravan", are campaigns or training initiatives that contribute to strengthening the perception of responsibility. At the same time perception of responsibility is a factor that motivates citizens to adhere to these messages from these campaigns or to participate in training. Other solutions require a good perception of responsibility for citizens or volunteers to engage, and this can be achieved through campaigns and training solutions such as the former ones. Another kind of responsibility is organizational responsibility that we find in "Social media strategy for scientific communication". Here the organisation responsible for communication should ensure a good follow-up of citizens' requests.

- Level of alert and preparedness

IMPLEMENTATION: For some solutions, users are expected to have particular knowledge or expertise to be able to provide help. Identifying what knowledge and expertise are needed, and plans to develop such, should be considered while developing implementation strategies.

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USE: Level of alert and preparedness affect the awareness about available apps or emergency numbers and the motivation to use them

- Sense of preparedness

IMPLEMENTATION: The feeling of being prepared may strengthen the self-confidence in being able to perform a task and the motivation to perform it. Therefore, implementation strategies should consider how to amplify the sense of preparedness.

USE: Sense of preparedness can increase confidence in the ability to perform a task. It can also increase understanding about the importance of performing a task or following recommendations. As described in "Be Ready Caravan", citizens can be aware of it, but still not seek by themselves to get prepared. Authorities have responsibility in increasing the sense of preparedness.

- Actual preparedness

IMPLEMENTATION: In some solutions, particular stakeholders play a key role. These stakeholders should be prepared during the implementation of the solutions to ensure an effective use of the solutions.

USE: Some solutions require the participation of actors with expert skills or knowledge. It is important to identify which skills or knowledge are needed, which persons possess them, how to develop and maintain them.

7.4.2 INDIVIDUAL BACKGROUND

- Beliefs

IMPLEMENTATION: Individual beliefs should be considered while developing implementation strategies if social groups with strong or diverse belief systems are among the target population.

USE: The way a solution is used depends heavenly on the belief system of the user, notably when sharing data or activating networks in a social group.

- Religiosity

IMPLEMENTATION: Solutions that strive to enhance the embedding of civil protection measures or persons should consider the religiosity of a given target population.

USE: Religiosity might affect the effectiveness of a solution, especially for solutions that disseminate information.

- Coping skills

IMPLEMENTATION: Specific medical skills and the capacity to manage stress and adversity enhance the efficiency of solutions.

USE: Soft skills like quick decision making and resistance to adversity and stress in interacting with citizens in distress facilitate an effective use of solutions.

- Access to training

IMPLEMENTATION: Specific skills or the capacity to understand the specificities of a solution for its providers require forms of training.

USE: Users should have training to acquire the technical and soft skills needed to use the solution.

- Level of trust

IMPLEMENTATION: Providers of solutions need to anticipate the trust of populations to them for developing appropriate solutions. Without a high level of trust, solutions target smaller user groups.

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USE: Trust is needed to incentivize users to transmit information or consider alert messages as well as comply with directives or recommendations.

- Family status

IMPLEMENTATION: The type of households and notably the presence or not of children or elderly affects the use of a solution.

- Socio-economic status

IMPLEMENTATION: Solutions need to be adapted to the available resources of potential users and anticipate situations and actors with a low socio-economic status.

USE: Solutions require access to basic internet or phone technologies, but do not require important resources.

- Gender

IMPLEMENTATION: Gender equality and diversity need to be considered while implementing solutions to ensure effectiveness and acceptance of target populations.

USE: The way a solution is used and if it is accepted depends on gender roles. Female victims or bystanders should be addressed by female volunteers to ensure sensitive interactions.

- Disabilities

USE: Digital tools and alert systems should be accessible for people with disabilities. Disabilities should be considered for ensuring the accessibility and usability of tools while developing and implementing solutions.

7.4.3 SOCIAL BONDS

- Social bonds

IMPLEMENTATION: Social bonds should be considered when implementation solutions that foster social actions.

- Communality

IMPLEMENTATION: Communality can strengthen solutions that involve actions in a social network and should be considered during implementation. Engaging participants and creating social relationships in communities are important.

USE: Communality can motivate people to help other people, to trust in persons in leading roles, to cooperate and to share perspectives more openly.

- Size of the community

IMPLEMENTATION: The size of community has an impact on the availability of resources and the nature of relationships in the community. Thus, strategies, communication and actions should be adapted to the size of the community. For example, recruitment strategies may differ in small and large communities.

USE: In case of a sharing app, the size of community has impact on the number of users, the activities on the app and thus on the effectiveness of the app. In a community-based solution, the size will impact on communication and cooperation between community members and on coordination needs.

- Geography

IMPLEMENTATION: Geography information may be exploited in a solution and thus should be taken into account during the deployment and testing of a solution. But in some cases, such as "Be Ready Caravan", even thus geography may be relevant, other factors are more important.

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USE: Geography may impact on the approach to coordinating actions and communication in a community. Geography has another impact in alert systems where, in order to reach people in an efficient way, the right geographic information is critical.

- Topography

USE: Topography may impact on the ability to perform an action in an adverse situation. In the case of the solutions characterized in depth in ENGAGE, topography is not mentioned to have impact on the implementation of solutions. However, identifying challenging areas for a solution and identifying alternative solutions may be relevant during the implementation.

7.4.4 SOCIETY

- Cultural conditions

IMPLEMENTATION: Solutions need to anticipate the cultural conditions of a target population to understand future uses of solutions, ensure participation and inclusion of all social groups and anticipate conflicts.

USE: Recognizing and adapting to cultural conditions ensures that solutions are appropriately used.

- Socio-economic conditions

IMPLEMENTATION: Solutions can be resource intensive and the resources available can influence the form of the solution. Specific technical infrastructures need to be acquired in some cases as it is a diverse workforce.

USE: Solutions need to be adapted to users with low socio-economic status. Users also need sometimes resources to acquire digital tools.

- Material conditions

IMPLEMENTATION: Necessary implementation infrastructure varies between solutions including technical and digital infrastructure, dedicated workforce or upkeep of volunteers.

USE: Volunteers need digital resources to be able to use a solution.

- Demographic characteristics

IMPLEMENTATION: Ethnicity, race, language and being from an urban or rural background need to be considered while implementing the solutions. Taking these factors into account makes it possible to tailor a solution for a specific demographic context.

USE: Some solutions try to address specific target populations. Hence, the demographic context determines user groups. Others need to build trust among specific groups. Identifying precisely specific demographic groups enables efficient use.

- Age of the population

IMPLEMENTATION: Age matters both for anticipating vulnerable target groups like elderly people and for tailoring solutions for fostering participation of younger people.

USE: Age influences the use of various solutions. Elderly people may have difficulties accessing digital tools. Younger populations might be more able to use digital resources.

7.4.5 ORGANISATIONAL CONTEXT

- Management

IMPLEMENTATION: Management covers various aspects. In the planning of an implementation, the aspects that the management should take care, should be identified. It might be ensuring

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collaboration between actors, planning for solving technical issues, recruiting and coordinating volunteers as described in the examples above.

USE: The depicted case relates to recommendations for the public sector to foster social actions. It is important managers provide support for and effective use of the recommendations in the organisations and that they motivate for collaboration with the actors involved in the social actions.

- Internal backing

IMPLEMENTATION: Strategies and solutions that require changes of practice often require internal backing for successful implementation.

- Mental Support

USE: Participating may be challenging. Helping injured persons or persons in distress can provoke emotional reactions. In such cases, it is important to provide follow-up to the responders.

- Collaboration

IMPLEMENTATION: The implementation of multiple solutions requires collaboration with various actors, such as responders, authorities or politicians. Collaboration is needed for different purposes, for example for establishing good coordination of resources or for promoting a solution.

USE: The use of multiple solutions also requires collaboration with various actors. In some cases, collaboration is indispensable for the functioning of a solution. In others, collaboration permits an effective use of the solutions.

- Relationship between NGO and first responder and authority

IMPLEMENTATION: The participation of volunteers in crisis requires previous agreements with authorities that are responsible for coordinating response in a crisis. It also requires establishing trust between volunteering organisations and authorities.

USE: Relationships establish ahead of a crisis will impact on the effectiveness of cooperation between actors.

- Marketing

IMPLEMENTATION: Solutions that depend on a critical mass of users require marketing for a successful deployment.

- Preparation and planning

IMPLEMENTATION: Preparation and planning are highly dependent on the nature off solutions. For the solutions described above, the preparation steps address various implementation aspects. It is part of the planning process to identify what preparation is needed.

USE: Again, preparation and planning are highly dependent on the nature off solutions. Lessons learnt from using the solution should be taken into account to enhance preparation and planning.

- Organisation's willingness to participate in the exercise

IMPLEMENTATION: Solutions often require commitment of organisations for their well-functioning. Barriers such as cost, lack of prioritisation, lack or resources may hinder an effective implementation of a solution.

- Organisation’s sense of responsibility

IMPLEMENTATION: Solutions require organisations to provide various types of support. Without a sense of responsibility, organisations may fail to do so. Measures should be considered to strengthen the sense of responsibility. For example, increasing the understanding of what a solution is and why it is important may strengthen the sense of responsibility.

- Response capacities of the organizations involved in the exercise

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USE: Analyses underline needs for planning measures. Organisations should not solely identify available resources but also plan to utilise them. Collaboration is pointed out as a critical measure to be planned.

7.5 Discussion

A wide variety of factors have impact on the implementation and use of the solutions, and the way a single factor impact may differ greatly among solutions. For example, "threat perception" has impact on the recruitment of citizen responders for "TrygFonden Hjerteløber (Heartrunner)", and on the effectiveness of "Community opinion leaders" in crisis management.

We observe that all factors are important. One factor that has impact on multiple solutions, both as implementation and use are concerned, is collaboration. Crisis management usually requires several organisations to work together, and this also yield solutions they use. Material conditions is another factor that has impact on the implementation of multiple solutions, indicating their well-functioning often depend on economic and physical resources. Some factors may be more important for particular types of solutions, such a communality for solutions of type "community ambassador". However, as our study consider few solutions within each solution type, we cannot generalize to other solutions of the same type.

For organisations considering implementing a specific solution included in this section, we recommend to reflect on the impact factors may have on the solution in their specific context. They should analyse if the factor may represent a risk for implementation or use in their context. It is also wise to take into account other factors. Our analysis focus on the main factors than have impact on implementation and use of each solution. A new context may amplify the impact of other factors. Regarding other solutions not included here, we recommend potential solution providers to use the list of contextual factors as a check list when conducting risk assessment in conjunction with developing plans for adopting the solutions. The detailed descriptions of how factors have impact on implementation and use on the included solutions can also serve as a source for inspiration during risk assessment.

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8 INFORMAL SOLUTIONS

8.1 INFORMAL SOLUTIONS

As disasters become more complex, and less predictable, formal disaster response plans and procedures often become less effective. Disasters can evolve in unexpected ways, making existing plans and procedures unsuitable or insufficient. In these cases, emergency services and authorities must improvise and adapt, deviating from established protocols to deal with the situation. This requires the ability to think on their feet and come up with creative solutions. Informal actors can also develop informal disaster response mechanisms to deal with unprecedented situations. Examples of informal disaster response mechanisms include:

- Informal procedures that were not previously planned: emergency responders might improvise a makeshift shelter for displaced residents out of whatever materials are available.
- Responses initiated by informal actors: volunteers might organize a community food bank to provide meals to people who have lost their homes in a disaster.

Informal disaster response mechanisms can play a vital role in providing relief and support to affected communities, especially in the early stages of a disaster when formal response systems may be overwhelmed. That's why, in the context of ENGAGE, we placed significant emphasis on capturing these procedures—referred to as informal solutions. A detailed description of how the project defines informal solutions can be found in D2.5, section 4.6.

8.2 CONTENT CREATION ON INFORMAL SOLUTION

Following the template presented in D2.5, section 4.6.3, we created an online form to collect information about informal solutions. The form included fields related to the name of the solution, who developed it, who is using it, what exactly is the solution, when and why it appeared, to what extent the solution was formalised, and where the solution belongs on the formality-informality quadrants (Figure 16 in D2.5). Then using this information, we describe the solution in a short story-like format, that will be published on the Knowledge Platform.

To initiate the data collection process, we utilized some of the solutions identified in D2.3. These solutions were revised and classified into 3 categories: ideas, concrete solutions, and to be deleted. We use the solutions categorised as ideas to search for concrete solutions among the same lines or serving the same purpose, for example, if there is a solution about using social media to help people with disabilities, we search for a concrete case that already happened and we collect detailed information about this case. Regarding the concrete solutions, we have a real example of a solution that was already applied, and we collect more details about it to fill in the missing information in the template. Concerning the solutions under to "be deleted" category, they were too generic solutions without any information that could guide our search for more details or similar solutions.

Following that, the online form was distributed among the project partners to add more solutions. All the collected solutions are stored in Airtable in a different database than the formal solutions. See Figure 13 for an overview of the solutions database in Airtable. Currently, our database comprises 15 solutions, each of which has undergone a thorough review by at least one partner within our project consortium.

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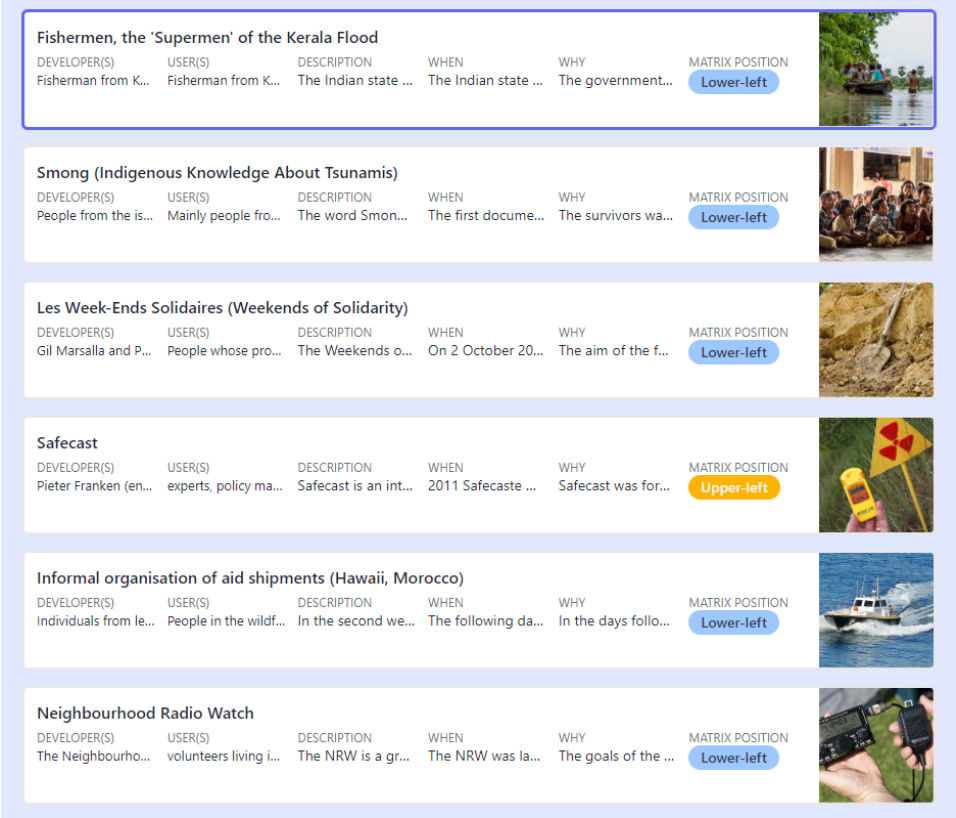

Figure 13. Screenshot of collaborative Airtable database where content for the informal solutions is stored

An example of how informal solutions are going to be described in the KP could be found below:

Solution Name: Smong (Indigenous Knowledge About Tsunamis)

Description: The word "smong" comes from the Devayan language of Simeulue, a small island in Indonesia. There are different ideas about the origin of the word, but it describes the phenomena experienced by most tsunamis in Indonesia; an earthquake followed by the retreat of the sea and a huge tidal wave.

Although the phenomenon of tsunamis is widespread in Indonesia, and the country's geological position puts it at high risk of tsunamis, tsunamis do not occur with such regularity that everyone is aware of the phenomenon, knows how to recognise it, and what to do. The first documented use of the word "smong" and its incorporation into everyday life began after a devastating tsunami in January 1907. The survivors wanted to remind future generations of the many casualties, the dangers of tsunamis, and how to behave in order to have the best chance of survival. The phenomenon behind the "smong" is described in songs, poems, and stories. They are often passed on from the older generation to the younger, at cultural events, celebrations or in everyday life. The contributions differ not only in their literary form, but also in their focus: some describe tsunamis as a natural part of their lives, others are warnings and advice, and still others are stories of loss.

While in many languages, including the internationally used Japanese word 'tsunami', the word 'tsunami' simply means 'harbour wave' or has a similarly descriptive meaning, the people of Simeulue associate the word "smong" with much more through their stories. They have many associations with the word "smong" that cause disaster risk reduction. First and foremost, they associate the phenomenon of the tsunami with the warning signals of earthquakes, the retreat of the ocean and the knowledge that a huge tidal wave could follow and wash over their island. The second aspect associated with the word "smong" is the action everyone should take when threatened by a tsunami: run away from the sea and move to higher ground, warn people and tell them to evacuate, and - if

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possible - bring simple items to ensure survival. The last aspect is to tell future generations about "smong" so that the disaster of 1907 does not happen again. Because of their knowledge and familiarity with tsunamis from their stories, people on the island flee to higher ground after an earthquake and warn each other. This saved many lives in the 2004 tsunami, even though the island was only about 60km from the epicentre. The Indonesian government and scientists were surprised that the tsunami, which claimed a staggering number of lives on other Indonesian islands, killed so few on Simeulue.

Comments:

- **Formalization:** After Simeulue's success story during the 2004 tsunami, the word "smong" and the culture around it received international attention. The focus was on indigenous knowledge, its interpretation and cooperation in modern crisis risk reduction. There was research into why the culture around "smong" was so successful on Simeulue and why songs and stories about tsunamis from other regions of Indonesia were not so successful. There was also criticism of the lack of information in the old stories, and consideration of how to combine traditional indigenous knowledge with new methods. Modern versions of the songs were written, and lyrics are added. In interviews, many Simeulues estimated that without the 2004 tsunami, their knowledge and traditions would probably have been lost. However, the success story of Smong shows its relevance and value and promotes the expansion and the continuity of the tradition.
- **Context:** The context in which the "smong" culture has developed is one in which stories are shared: from the older to the younger generation, in the form of songs, stories and poems during celebrations and in everyday life. According to interviews with islanders, these traditions are threatened by the changes in activities brought about by modern media. At the same time, a long period without a catastrophe, in which the content of the stories and songs no longer seems relevant, is also a reason why the tradition seems less relevant and is less lived.

However, personal experiences passed down from generation to generation and the presence of the tsunami theme in everyday life through songs and stories mean that the information passed down is easily accessible and present. Thus, indigenous knowledge can be a powerful disaster preparedness tool that could be updated with modern knowledge and integrated into modern entertainment.

Links for extra information:

- https://www.e3s-conferences.org/articles/e3sconf/pdf/2022/07/e3sconf_aiwest-dr2021_03010.pdf
- https://iopscience.iop.org/article/10.1088/1755-1315/148/1/012005
- https://www.sciencedirect.com/science/article/pii/S1878029614000711
- https://theconversation.com/why-14-years-after-the-aceh-tsunami-smong-should-be-part-of-the-indonesian-vocabulary-105809
- https://www.preventionweb.net/news/how-century-old-local-story-saved-thousands-lives-and-can-save-more-future

8.3 The inclusion of informal solutions in the CoS

As stated above, informal solutions are actions used by both formal first responder actors and by civilians at emergency sites. The spectrum for informal solutions is wide and undefined. As shown

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in the Figure 14 below, the informality of actions is diversified, and varies from putting sacks of sand to stop floods, to firefighter's involvement of citizens about prioritizing resources.

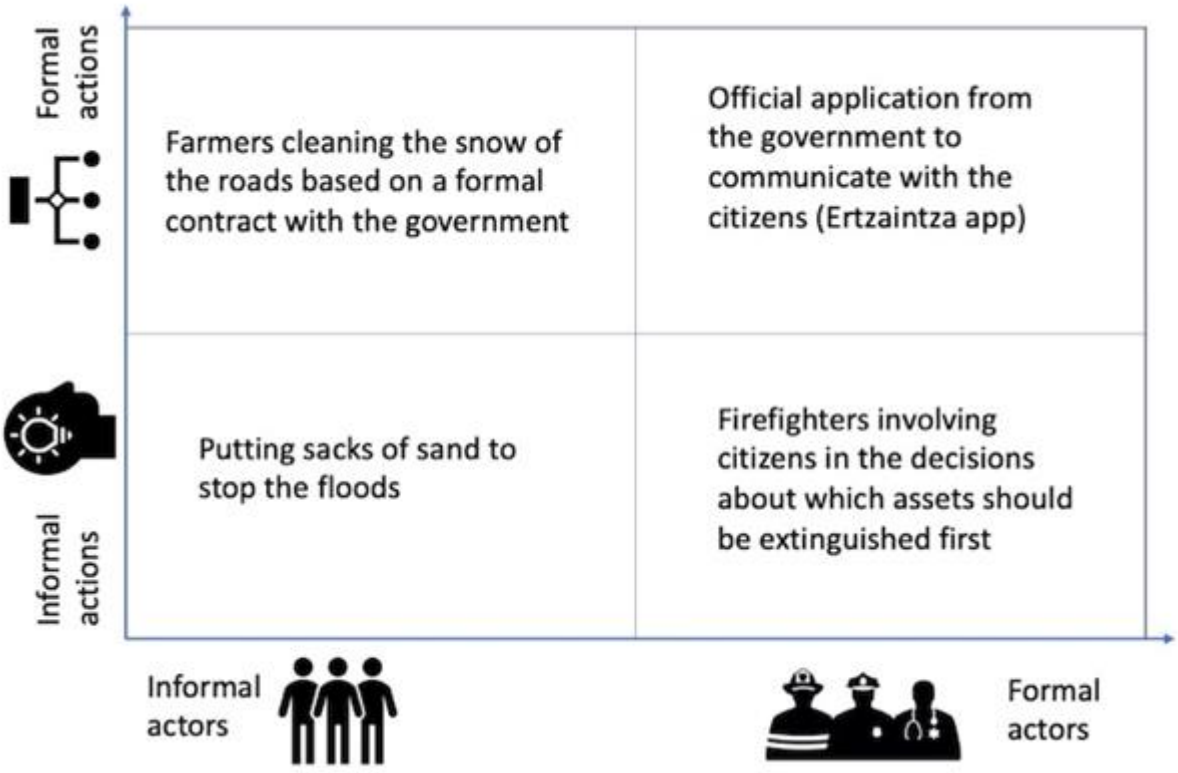

Figure 14. Informal/formal solution matrix

When deciding whether to include the informal solutions into the CoS, there were several questions raised, and some of these issues were discussed in the KI-CoP workshop in Rotterdam during spring 2023. Most actors across the project agree that it should be included, but the main issue has been on how to do that in the most sufficient way.

There were initially two options on how to present the informal solutions and one of the options was to include them among the formal solutions. A second solution was to distinguish them in a separate place in the CoS. The KI-CoP members of the project were split on this point, and there was not a consensus one either of the ways.

Although the informal solutions ended up in distinguished sections, the members who argued that the informal solutions could be added in the same section as the formal solutions considered this because their main idea was that the CoS was mainly for inspirational purposes anyway and they are not concerned with if the solution was formal or not; they were just focused on what had happened. Elaborating on the idea that during crisis management the problem and the solution is way more important than the actors who implemented it.

While informal solutions were categorized into distinct sections, some KI-CoP members believed that these solutions could be integrated into the same section as the formal solutions. Their perspective was based on the notion that the CoS primarily serves as a source of inspiration, and the formal or informal nature of a solution is less relevant. Their primary focus was on the events themselves. This perspective was elaborated upon by emphasizing that, during crisis management, the importance lies in addressing the issue and finding a resolution, rather than dwelling on the specific actors responsible for its implementation.

One of the main arguments for dividing them into one section was because the formal and informal solutions vary so greatly in nature. The formal solutions are established, legal and planned actions

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during emergencies. While the informal solutions are spontaneous actions occurring at site with specific prerequisites and context. Because of this, the premises for the use of these solutions are quite different, and that is important to emphasise for the stakeholders that want to use solutions.

In many cases, the informal actions might also be going against what authorities are stating and can in many cases be illegal. It is therefore responsible for ENGAGE to keep these solutions separated from formal solutions. First responders in some countries may suffer from liability and punishment for going outside of their formal mandate. This can have personal consequences for many of them, and they therefore may be reluctant to use them.

Another argument for keeping them separate is the access to and structure of data. The informal solutions might have occurred one time with specific contextual factors, and sometimes they are the results of something formal failing. Because of this, very little data has evolved about each of the informal solutions. Therefore, the data quality is low, and not as valid as the data for the formal solutions that have occurred several times and eventually are formalised. This also requires structuring the data differently, and it makes little sense to keep informal solutions in the same sections as the formal solutions.

Many informal solutions evolved out of the extensiveness of the disaster, in which authorities are lacking efforts to meet the needs for all the affected people. In other cases, informal action may come from the lack of trust in authorities, and some informal actor came out of a coalition between informal and formal actions.

One final remark, given that the solutions fall into a range from informal to formal, some of the solutions we have are categorized as both formal and informal. For example the Safecast solution is provided by informal actors, specifically, a group of volunteers as part of a non-profit organization. It was initiated after the Fukushima earthquake in 2011 as a response to the lack of publicly accurate and trustworthy information about radiation. With time the platform became a source of reliable environmental information for policymakers, experts and the public. With this transition the solution is somehow formalised, and the platform follows a well-established procedure to collect and share the data, hence, it fits also into the formal category of solutions although it was initiated by informal actors. The solution is described below:

Solution Name: Safecast

Description: Safecast is an international volunteer driven non-profit organization whose goal is to create useful, accessible, and granular environmental data. It was formed in response to the lack of publicly accurate and trustworthy radiation information after the Fukushima earthquake in 2011. Safecast began monitoring, collecting, and openly sharing information on environmental radiation. The information has proven useful to experts, policy makers, and the public. The system was then extended to monitoring air quality.

Safecast provides a set of hardware and software tools for gathering and sharing accurate environmental data in an open and participatory fashion. Safecast benefits from having a technically skilled pool of collaborators around the globe. All tools are available open source. All Safecast data is published, free of charge, into the public domain under a Creative Common license.

The tools provided by Safecast include: the mobile Safecast app for accessing radiation measurements and performing measurements using various instruments such as a Geiger or a scintillation counter; the mobile, GPS enabled, logging, radiation sensor bGeigie Nano; the outdoor air quality monitoring solution Airnote (built in partnership with Blues Wireless); the educational geiger counter kit "Kids Geigie"; the solar based radiation monitoring devices Solarcast and Solarcast Nano.

Comments:

Formalisation: The measurements have been extended to other environmental data from countries around the world. This solution is also part of the catalogue of solutions and an example of how solutions often start small from a need and then spread to other countries, for other crises,

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in other contexts, or become part of everyday life. It also emphasizes the idea that the formality or informality of a solution is not a clear cut, it falls into a spectrum. A private organization in this case is not a formal actor, it is not part of emergency organisations, however, they created a well-established procedure to help prepare for disasters.

Context: In the aftermath of the Fukushima accident, there was uncertainty about what the government was saying about the dangers of radiation. This solution overcomes the lack of information or the lack of trustworthy information for the population. By allowing residents to buy meters and enter their data into the database, a network of data from sources other than government measurements is created. Particularly in countries where people distrust the government, this solution provides a way for them to obtain their own or independent data. In addition, community participation in the measurements could lead to a sense of ownership and additional awareness and preparedness.

Links for extra information:

https://safecast.org/about/

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9 CONCLUSION

To sum up, the CoS provides a comprehensive overview of solutions that increase the capacity of citizens and communities to deal with adverse situations. Therefore, the CoS is primarily targeting authorities, first responders and the civil society that wish to investigate solutions matching their needs. Further, the CoS is also relevant for researchers and developers who wish to identify gaps and explore the innovation landscape, and who seek inspiration for developing new solutions. This deliverable focuses on the process of creating and populating the CoS, and thus is relevant for those who wish to understand the rationale for the choice of solutions, or to develop a similar catalogue related to societal resilience, citizen participation or other topics. In this section, we address matters of importance both for the users of the CoS and the users of this deliverable.

9.1 THE COMPLEXITY OF POPULATING THE COS

Most solutions in the CoS were identified by the project researchers, some proposed by the members of the Community of Practice. Extracting information for these identified solutions has sometime been intricate. Some descriptions were inaccurate, some developed for commercial purposes. Information is also often spread among multiple sources. The retrieval of information thus requires detective work which might include contacting solution providers for checking understanding.

The classification has also been challenging. The development of an initial information structure, including category group and categories, was done in cooperation with end-users and KI-CoP-members and the structure was tested classifying a small set of solutions. Although the category groups have remained stable, new categories were gradually added to the benefit of precision, but to the detriment of usability both from the perspective of the author of the solution description who selects categories, and from that of the user who searches and filters solutions. Adding new categories normally requires re-classification of solutions earlier added to the CoS, which has not been done. Further categories were not defined and not applied consistently by authors. During the second phase of the project, a terminology was therefore developed for all categories, and some categories merged aiming at simplifying classification. All solutions were then reviewed.

Another challenge we faced was maintaining the accuracy of the descriptions of the solutions in the CoS. Some solutions are being further developed, and some are discontinued. Some discrepancies between the description in the CoS and the official information were detected by the project contributors during the revision. Some were reported by the KI-CoP-members. Descriptions have been revised when needed.

Due to these challenges, the CoS should be considered as an entry point to discovery of solutions. The CoS can inspire and can be used to understand gaps, as presented in Section 6.2, but does not provide a full picture of the solutions.

9.2 THE CONTEXT OF SOLUTIONS

An important aim of the ENGAGE project is to investigate the situated and dynamic nature of resilience. This is addressed in CoS through the category groups "important factors for implementation" and "important factors for use". Building upon the classification of contextual factors developed in WP1, these factors are described for the 25 solutions that were characterised in depth. As described in Section 7, contextual factors have various kinds of impact on different solutions. Also, for different solutions, different groups of factors have impact. When implementing these 25 solutions in new contexts, we recommend to not solely consider the factors we have identified, but the whole list of contextual factors as the context may amplify the impact of other factors. The list of contextual factors is relevant as a check-list when planning the adoption of solutions.

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11 APPENDICES

11.1 GLOSSARY

The content of the Knowledge Platform uses a number of terms related to tools and methods for disaster management and citizens' participation in disaster management. The terms are used in the presentation of the solutions included in the Catalogue of Solutions. Some of them are used in filtering. The following glossary provides the definition of these terms.

Table 13. Terms used in the description of basic information for the solutions

Category group	Category	Description
Implementation type		Approach used for implementing the solution.
	Alert system	Solutions allowing to notify a group of citizens about critical events.
	App	An app (or application) is a software program running on a computer, tablet, smartphone or other electronic devices. Apps are usually designed to perform a specific function for the user.
	Awareness campaigns and training	Initiatives aiming at increasing the knowledge of citizens about possible disasters and accidents, preventive measures, actions to take in the event of disasters, and/or tools that can help them to handle when crisis arise. For example, training campaigns ins school. This also includes the training of organized volunteers. For example, preparing volunteers otherwise engaged in social services to help during crisis.
	Call centre	A central service where citizens can obtain informed help or advice during crisis situations.
	Community ambassadors	Initiatives aiming at preparing informal actors and gaining their support during crisis situations, through the support from community leaders.
	Community of Practice	A group of people with a common interest who share best practices and/or develop new knowledge.
	Guidelines and plans	Advice, standards or plans regarding actions to take during a crisis.
	Incentives	Measures that motivate for establishing activities that improve preparedness and enhance resilience.
	Inclusive and psychological support	Assistance that helps citizens to cope with a crisis.
	Media	Means of communication such as radio, TV, newspapers and also social media.

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Category group	Category	Description
	Web service or other digital service	Online spaces providing services to informal or formal stakeholders. Examples of services are information sharing and resource management.
Solution provider or user		The organisation responsible for providing the solution or using the solution to provide a service to the target population. For example, a company may provide an alert system to authorities, and authorities use this solution to provide an alert to citizens.
Target population		The individuals or organisations at which the solution or service provided by the solution is aimed. For instance, citizens may be the target group for an awareness campaign.
	Citizens	Residents in a city, country or other region that are not specialized in the tasks of crisis management (as distinguished for first responders and employees in emergency services)
	Citizen groups at risk	Citizens with special needs and considerations. This covers vulnerable citizens. For example, children, pregnant women, senior citizens or other individuals with functional disabilities. This also covers citizens whose vulnerability has increased following the crisis. For example, citizens located on the site where the crisis occurs.
	Civil defence	A group of people who are not part of the military but are trained to protect and help people if an enemy attacks their country or if there is a natural disaster (such as a flood or earthquake)
	Civil society	Often defined as the "third sector" of society. Civil society includes an array of different causes, groups, unions and NGOs. Their combined aim is to hold governments to account, promoting transparency, lobbying for human rights, mobilizing in times of disaster and encouraging citizen engagement.
	Emergency organisations and services	Emergency organisations are structured organisations with overall responsibilities and organisational aspects for initial and ongoing emergency response and mitigation. Emergency services may be organised by authorities or private organisations.
	European Commission	The executive organ of the EU.
	First responders	Persons or organisation (such police officers or paramedics) who provide immediate assistance on the scene of an accident or emergency.
	Healthcare workers	Anyone who works in a healthcare or social care setting, including healthcare students on clinical placement, frontline healthcare workers and other healthcare workers not in direct patient contact.

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Category group	Category	Description
	NGOs	Non-Governmental Organisations, meaning organisations independent of state authorities.
	Organised volunteers	Persons who voluntarily undertake a service, such as one who engage in civil society organisations voluntarily. Volunteers can contribute in several ways to crisis: before, during and after crisis, through preparedness measures, clean ups or fundraising campaigns.
	Public authorities and policy makers	Public authorities and policy makers are people with legal mandates to make decisions and policies in certain areas. This can be on several levels such as state level, region level or municipality level.
	Radicalised and violent individuals	Radicalisation means someone is being encouraged to develop extreme views or beliefs in support of terrorist groups and activities.
	Spiritual leaders	Religious leaders are usually attached to particular buildings or social centres where they conduct teaching, preaching, meditation, worship, prayer, or pastoral functions.
	Research organisations	Research organisations conduct research, i.e., an organized and systematic investigation into something. This category also includes universities, i.e., institutions of higher learning providing facilities for teaching and research and authorized to grant academic degrees.
	Spontaneous volunteers	Spontaneous volunteers are persons who, despite not associated with any existing emergency management response system, are ready to help in a disaster situation. For example, zero order responders, i.e., persons at the scene of a disaster and affected by the disaster, may start to coordinate response.
	Students	Persons studying at a college, university, or school.
	Children	Young persons.
Purposes		The main aim of the solution.
	Enhance risk awareness	Raising understanding within the population about what risks exist, their potential impacts, and how they are managed.
	Facilitate resource allocation	Assigning different types of resources e.g., financial, machinery, or human resources to a specific community to enhance its resilience or to face a specific disaster.

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Category group	Category	Description
	Enhance preparedness	Preparing the population to apply the necessary preventive measures to face potential emergencies.
	Capitalise social networks and relationships	Building upon the existing relationship among community members to enhance resilience.
	Improve health and mental outlook	Addressing the physical and mental health vulnerabilities that may be affected by a disaster.
	Empower governance and leadership	Enabling community members to engage in making decisions related to their communities and empowering community leaders to make decisions in case of a disaster.
	Improve communication and information sharing	Exchanging information between the emergency personnel and the population about potential threats and ongoing emergencies and establishing a common understanding about disaster-related topics.
	Efficient response	Ability to handle a crisis by restoring critical activities, protecting and saving lives, and providing immediate assistance without wasting resources.
	Quick recovery	Mitigating the effects of a disaster on a community allowing the community members to cope and adapt to the impacts of disasters.
Support to first responders		Solutions that contribute to facilitate the tasks of the first responders.
	Organise and coordinate volunteers	Solutions that support first responders to plan and assign tasks to volunteers, to help volunteers in implementing tasks and to follow-up achievements.
	Improve autonomy, coping abilities, and proactiveness of citizens	Solutions that increase citizens' ability to take responsibilities during crisis situations and react proactively to reduce the impact of the crisis. For example, solutions allowing citizens to provide first help aid.

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Category group	Category	Description
	Communicate with or alert citizens	Solutions supporting the exchange of information between first responders and citizens. First responders may provide information to citizens, and conversely citizens collect information useful to first responders.
	Improve preparedness level among citizens	Solutions that increase citizens' ability to understand risks and prepare for a crisis. For example, citizens should know where they can find information, or they should set up a storage with food and water.
	Improve involvement of and cooperation with citizens	Solutions allowing first responders to get support from citizens during crisis situations. For example, solutions that allow citizens to provide material resources, such as clothes.

Table 14. Terms used in the description of in-depth information for the solutions

Category group	Category	Description
Coping actions		All actions intended to mitigate or adapt to an adverse event actively. For example, actions that ensure mere survival, helping one's family and helping others in a disaster situation.
Important factors for implementation		Conditions that have shown to influence the implementation of the solutions. The adopters of solutions should keep in mind that some conditions may make difficult the implementation of a solution. For example, cultural conditions may influence the motivation for adopting a solution.
Important factors for use		Conditions that have shown to influence the use of the solutions. For example, coping skills may influence how well a solution is being used.
	Situational factors	Conditions that enable immediate coping actions during an adverse situation. These include propinquity, threat perception and level of alert and preparedness.
	Propinquity	Propinquity refers to proximity to the event. It might be proximity in time and space, or the emotional affinity to the event.
	Threat perception	Threat perception refers to the perception of likelihood, severity and intrusiveness in an adverse situation. Intrusiveness encompasses that the persons targeted by the solutions experience themselves the threat..

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Category group	Category	Description
	Risk awareness	Recognition of the potential for hazards, risks, and incidents that may occur.
	Perception of response	Understanding of the measures for reducing or eliminating risks.
	Perception of responsibility	Sense of individual or collective responsibility to prepare or act in case of a crisis.
	Level of alert and preparedness	Extent in which individuals and social groups are prepared to understand risks and to be willing and capable to respond to the event in a particular crisis. This relates to the sense of preparedness and the actual preparedness, access to training, preparation and planning, organisation's willingness to participate in the exercise and the response capacities of the organizations involved in the exercise.
	Sense of preparedness	Organization's or individual's state of readiness and the belief that they are adequately equipped to effectively respond to and navigate through a crisis.
	Actual preparedness	Actual state of being ready for an adverse event to happen.
	Individual background	Conditions that explain coping actions with individual capacities, social positions and beliefs. These include religiosity, coping skills, level of trust in others, family status, socio-economic status, gender and disabilities.
	Beliefs	All forms of convictions that enable action. For example, political and religious beliefs. This also includes the perception of responsibility based on the idea that perception of responsibility cannot be dissociated from the way actors make sense of a situation based on their beliefs.
	Coping skills	All the relevant skills for engaging in efficient coping actions. For instance, digital literacy.
	Digital literacy	Capacity to find, evaluate, and communicate information by utilizing typing or digital media platforms.
	Access to training	Access to educators, pedagogical material and the corresponding resources to provide training.
	Level of trust	Level of trust in other individuals or social groups.
	Family status	Size of household and number of children.
	Socio-economic status	A combination of individual level of education, income, and occupation.
	Gender	Socially constructed roles, behaviours, expressions and identities of girls, women, boys, men, and gender diverse people.

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Category group	Category	Description
	Disabilities	A physical, mental, cognitive, or developmental condition that impairs, interferes with, or limits a person's ability to engage in certain tasks or actions or participate in typical daily activities and interactions.
	Local environment	Conditions that structure coping actions on a local level. These include communality and topography.
	Social bonds	Degree to which an individual is integrated into the society.
	Communality	Strength of social bonds and the extend of social networks in a community.
	Size of the community	Population density or number of individuals within a community.
	Geography	Physical, biological, and cultural features of an area. Topography is an aspect of geography.
	Topography	Physical access or possibility to evacuate the crisis affected area.
	Society	Conditions that enable coping actions and that refer to the structure of society. These include socio-economic conditions, demographic characteristics and cultural conditions.
	Socio-economic conditions	A combination of collective level of education, wealth and access to resources. This also includes material conditions.
	Material conditions	Concrete aspects and resources primarily associated with economic and physical factors that influence their well-being, opportunities, and overall quality of life of social groups or society as a whole.
	Demographic characteristics	Demographic characteristics of the affected population, such as age and ethnicity.
	Age of the population	Relative age of a target population or social group.
	Organisational context	Aspects related to the way the actors involved in crisis management are organised and behave. These include the management structure, the relationship between actors (e.g., NGOs, first responders and authorities), the collaboration capabilities, the organisation's sense of responsibility, the level of informality and internal backing.
	Management	Management is related to the solution, not to the wider scope of crisis management. Management is about planning and organising the solution, allocating resources to it and following up its deployment and use.

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Category group	Category	Description
	Internal backing	Support from the leadership and employees within the organisation to the solution and to the anchorage of the solution in the organisation strategy.
	Mental support	Support that people receive to protect their mental health.
	Collaboration	Process by which individuals or groups from different organizations work together to achieve common goals or objectives.
	Relationship between NGO and first responders and authorities	Ability of these key organisations in a crisis to collaborate and coordinate effort.
	Marketing	Means and resources to promote a solution.
	Preparation and planning	Process of creating a roadmap for implementing and using a solution. For example, it includes allocating resources, and anticipating potential barriers and defining contingency plans. It also relates to the relation between a solution and existing disaster or crisis planning.
	Organization's willingness to participate in an exercise	Motivation and commitment of the organisation to contribute to an exercise.
	Organisation's sense of responsibility	Organisation's recognition of the obligation it has toward various stakeholders.
	Response capacities in an exercise	Abilities and resources of organisations to take measures to successfully participate to the exercise.
Degree of transferability		The extent in which a solution can be implemented or used in other contexts, bearing in mind the important factors for implementation and use. The degree is described as high, medium or low.
Degree of modifiability		The extent in which a solution is flexible and can be adapted to new situations, contexts or needs. The degree is described as high, medium or low.

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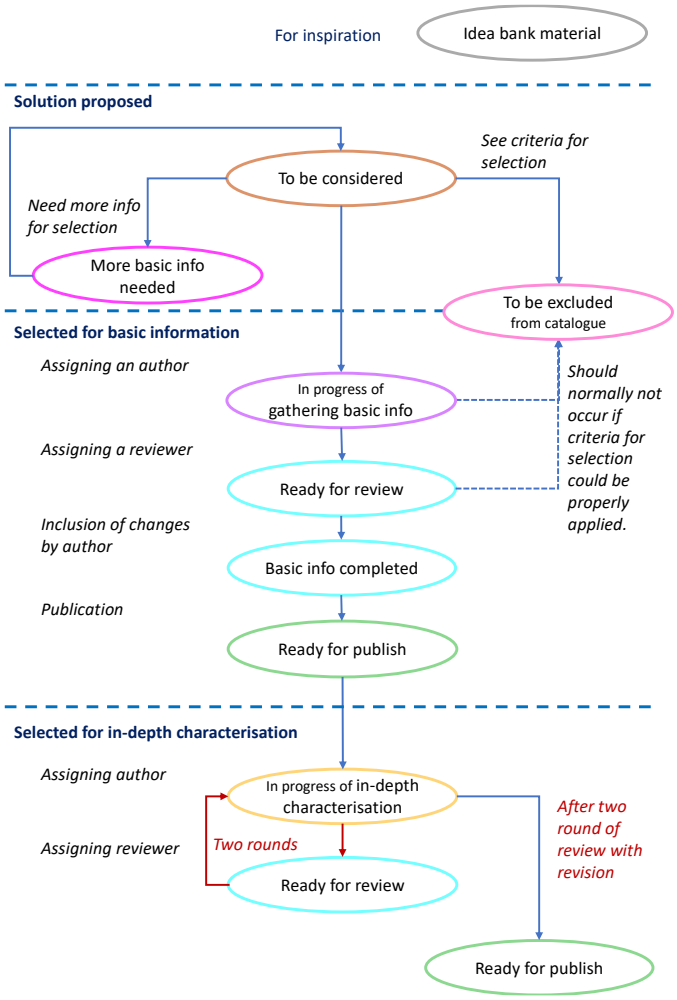
11.2 PROPOSING NEW SOLUTIONS

Review status

The *Review status* in the table solutions allows the WP3 leader to follow-up the progress of the process when adding new solutions. The field should be properly set when completing a step in the process. *NB: The status is not solely about review, but also editing.*

You may add a short explanation of the decision made at each step in the field "Review status - comments".

The following flow chart illustrated the transitions between review statuses.



Proposing new solutions

External users

- Use the form: LINK REMOVED FOR PROJECT PURPOSES

Project partners

- Use the form as external users or add the solution directly in Airtable.
- When working directly in Airtable, set the field ***Review status*** to *To be considered.*

Send email to the WP3 leader for informing about the new solution.

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Filtering proposed solutions

The WP3 leader is responsible of going through proposed solutions and selecting the ones that should be included in the catalogue.

Selection criteria:

- Involve interaction with citizens or participation of citizens
- Corresponds to a gap, or type of solution previously unidentified
- Is successfully implemented/used somewhere
- Is something we can find sufficiently detailed information about (even better, we can contact people involved in developing or implementing it)

If decision cannot be made based on the provided information, the WP3 leader may ask for additional information. The field ***Review status*** should be set to *More basic info needed*.

If the solution fulfils the criteria, the WP3 leader then assigns an author and a reviewer for the solution. The field ***Review status*** should be set to *In progress of gathering basic info*.

Otherwise, when criteria are not fulfilled, the field ***Review status*** should be set to *To be excluded from catalogue*.

Editing and reviewing basic information

After the author has completed information, s-he sets the field ***Review status*** to *Ready for review* and send email to the reviewer.

When the review is completed, the reviewer sets the field ***Review status*** to *Basic info completed* and informs to the author. The author updates the information according to the review comments and informs the WP3 leader.

During the editing and reviewing steps, the author or reviewer may struggle to find information or find that other selection criteria are not fulfilled. In that case the field ***Review status*** should be set to *To be excluded from catalogue*.

Publishing basic information

The WP3 leader approved the updated information and sets the ***Review status*** to *Ready for publish*.

In depth-characterisation

When a solution is selected for in-depth, the WP3 leader assigns an author for collecting, analysing and summarising the information. The WP3 leader also assigns two reviewers (one academic partner and one end-user partner).

The author should follow the instructions in: LINK REMOVED FOR CONTENT PURPOSES. Before editing information, the author should set the field ***Review status*** to *In-progress of in-depth characterisation*. After information is completed, the author should set the field ***Review status*** to *Ready for review* and contact the reviewers.

After review, the author should update the information according to the review comments and inform the WP3 leader.

The WP3 leader approves the updated information and sets the ***Review status*** to *Ready for publish*.

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11.3 MINIEXTENSION FORM FOR ADDING NEW SOLUTIONS

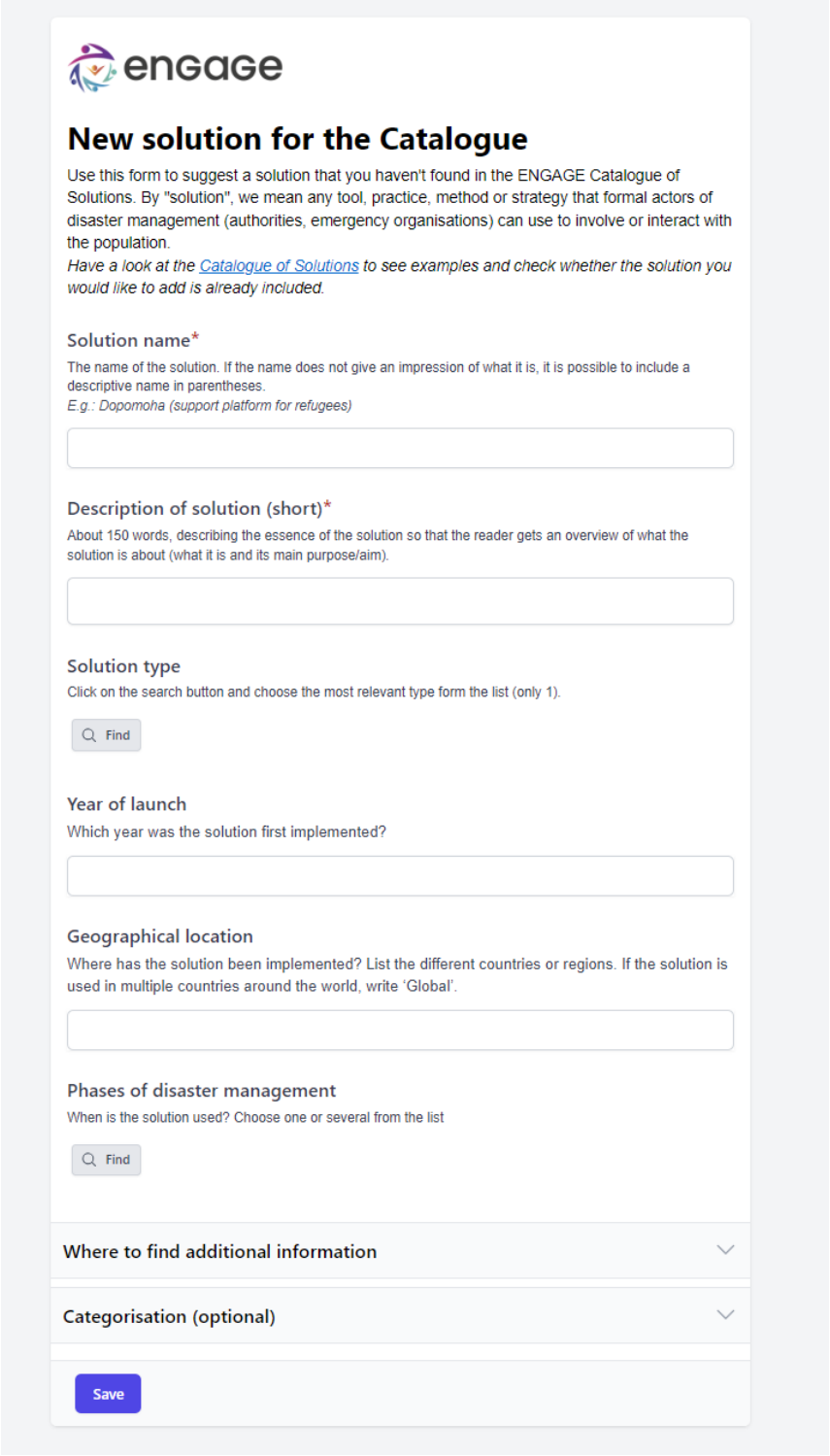

Figure 15. Mini-extension sheet on proposing new solutions

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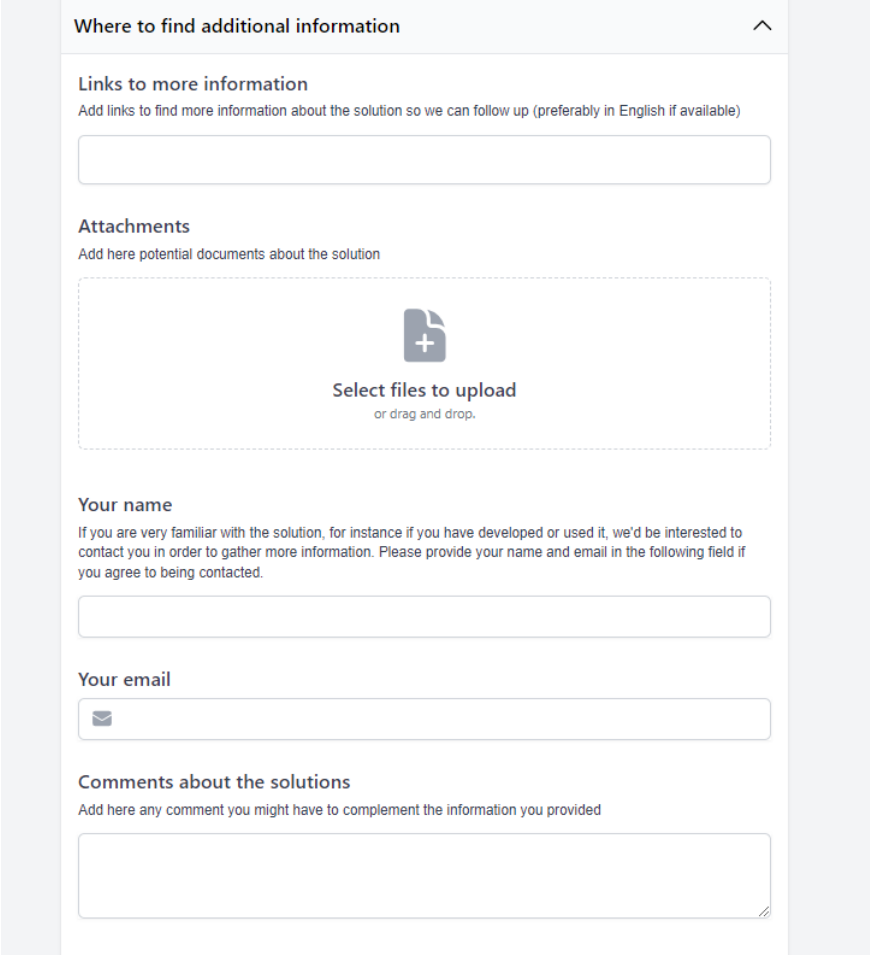

Figure 16. Continuation of form part 1: Additional information

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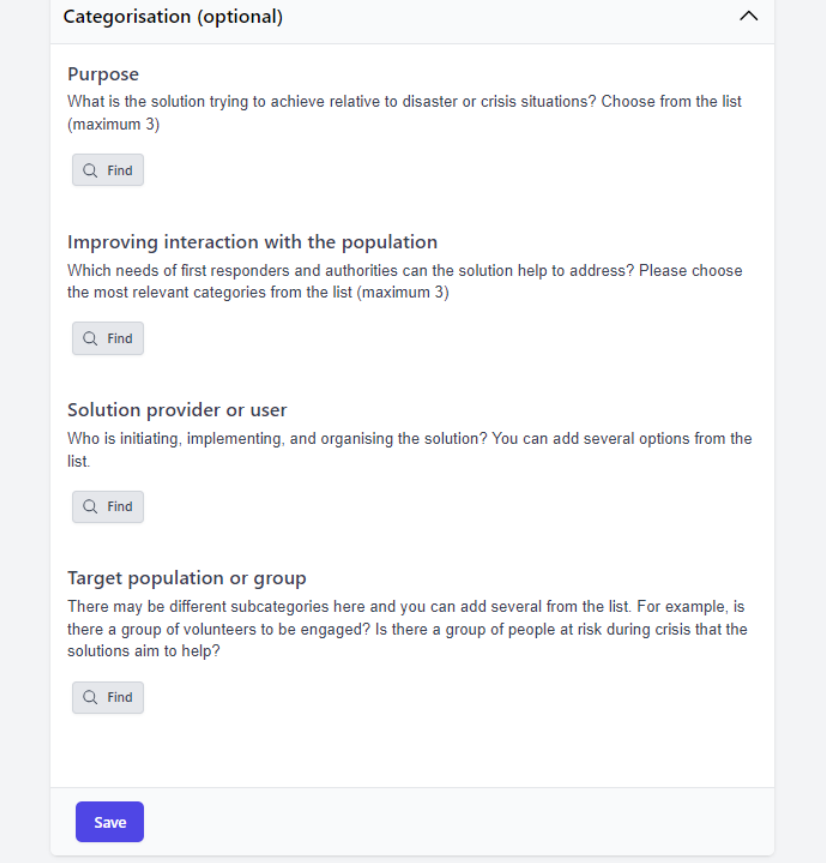

Figure 17: Continuation of form part 2: Optional categorisation

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11.4 CONTENT CREATION INSTRUCTIONS

Here you will find instructions for content creation to the Catalogue of solutions. The aim is to streamline the content, ensure that we follow the same formatting, and that the text is as reader friendly as possible. There are three sections in the document:

1. Data collection and content creation
2. Language and formatting
3. How to add content to the Airtable database via miniExtensions

1. Data collection and content creation

Each solution in the Catalogue should have basic information filled out before it is published on the Knowledge platform. A selection of the solutions in the Catalogue will be described in-depth. The different categories – basic and in-depth – are described in Table 1. **The definition of categories and values is provided in the document DOCUMENT LINK REMOVED FOR PROJECT PURPOSES developed by the Task Force «About the Knowledge Platform».**

The in-depth characterisation of solutions will be a continuous task throughout the project. For the data collection of in-depth, we aim to gather information from relevant websites, reports, and other available sources. In addition, the aim is to interview 1-3 persons. These interview subjects may be developers, owners, organisers, and users of the solution. Interviews often give a better understanding of written reports, online information, and not least context. Interview subjects may also have for example available reports that we can access. The interview template can be found DOCUMENT LINK REMOVED FOR PROJECT PURPOSES (make sure to save copy so that we always have a clean template).

Table 15. Information categories (basic and in-depth)

Basic information	
Solution name	Add new or modify existing name if needed
Short description	About 150 words, describing the essence of the solution so that the reader gets a sense of what it is about.
Solution type / Implementation type	Choose the most relevant one from the fixed drop-down list
Purpose	What is the solution trying to achieve? Choose from the fixed drop-down list – if you want to propose a new purpose, send an email to <e-mail to WP3 leader>_
Needs of first responders	You may choose several from the fixed drop-down list. This is a detailed list of needs that is used by WP2 in the analysis of solutions.
Needs aggregated	Choose the most relevant categories of needs from the fixed drop-down list. This is a shorter list of needs that aggregates the detailed needs. These are the needs that are presented on the Knowledge Platform.
Year of launch	Which year was the solution first implemented?
Geographical location	Where has the solution been implemented? List the different countries or regions, for example "Europe". If the solution is used in multiple countries, you may list these countries, for example "France and Belgium", or specify "Multiple countries". For solutions used around the world, you may also specify "Global".

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Maturity level	Choose between implemented, planned, and proposed.
Solution provider or user	Who is initiating, implementing, and organizing the solution? The solution provider is the organisation responsible for providing the solution while the solution user is the organisation that makes use of the solution to provide a service to the target population. You can select several options from the fixed drop-down list.
Target population or group	What part of the population is the solution provided for? For example, is there a group of volunteers to be engaged? Is there a group of citizens at risk during the crisis that the solution aims to help? You can select several options from the fixed drop-down list.
Phases of disaster	Choose one or several of *Before, during, after*.
Links to more info	Add links to find more information (preferably in English if available) after checking that the links work.
In-depth characterisation	
Purpose and outcome (what can the solution achieve?)	
Long solution description	Max 500 words. This should not be a copy of the short description, but add more in-depth information (e.g., on how the solution works, purpose of the solution and more about the coping actions)
Coping actions	What kind of actions is enabled by the solution? Choose from the fixed drop-down list – if you want to propose a new coping action, send an email to <email to WP3 leader>
Added benefits	Additional benefits other than the overall aim? (not mandatory to fill in)
Lessons learned (what have we learned from cases of the solution?)	
Evaluation from cases	Include short description of the case (e.g., a crisis or disaster in which the solution has been used, evaluation from different countries or areas within one country), including description of the area. Has there been any evaluation work done in connection to the solution? What was the process(es) and what were the findings? If available, highlight the impact and outcome of a solution. If available, add information about validations of the solution. Each case should have a title
Challenges	Are there any specific challenges that have occurred in cases of the solution? Describe each identified challenge with a few sentences. Each challenge should have a subtitle. If relevant, each case should have a title.
Requirements	What *needs* to be in place for the solution to work or function well? Describe each requirement with a few sentences. If available, highlight aspects such as resource intensiveness, costs, and effectiveness. If you have several cases, you can write about general requirements (based on the cases) or describe requirements for each case.

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	Each requirement should have a subtitle. If relevant, each case should have a title.
Guidelines (what is important to consider when choosing to implement and use the solution?)	
Degree of transferability	Choose between high, medium and low
Describe degree of transferability	A few sentences about the transferability of the solution. Example: "The degree of transferability of this solution is regarded as high by researchers based on analysis of information from evaluation reports and interviews with developers and implementers of the solution. […] Information obtained in interviews, however, suggest that it will be difficult to transfer the solution to an authority."
Degree of modifiability	Choose between high, medium and low
Describe degree of modifiability	A few sentences. Example: "The extent to which this solution is modifiable is regarded as high. Through interviews it became clear that there have been several modifications of the original concept in different local organisations."
Important factors for implementation (contextual aspects)	Choose relevant factors from the fixed drop-down list – if you want to propose a new factor, send an email to <email to WP3 leader>
Describe important factors for implementation	Describe each identified important factor that you added with a few sentences that trigger reflection by the reader when considering implementing the solution. Each factor should have a title.
Important factors for use and effectiveness (contextual aspects)	Choose relevant factors from the fixed drop-down list – if you want to propose a new factor, send an email to <email to WP3 leader>
Describe important factors for use and effectiveness	Describe each identified important factor that you added with a few sentences that trigger reflection by the reader for the use of the solution. Each factor should have a title.
Source	Add the different sources you have used (e.g., survey, interviews, websites, reports)
Review status	When you are done editing the text, set the status to *Ready for review* and notify the reviewers by email. When the review process is finished and the content has been approved, set the status to *Ready to publish*

2. Language and formatting

2.1 Spelling and language

- Standard British spelling is used, with "s" endings (e.g., organisation, globalisation, analyse).
- Slashed constructions (and/or, homes/workplaces) are not used.
- Contractions are not used (don't, they'll, won't) but are spelled out (do not, they will, will not).
- Make sure to use easy-to read language and try to avoid professional terminology.

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2.2 Abbreviations, acronyms, and web links

- Abbreviations (i.e., e.g., et al., etc., %) are used only within parentheses; in the running text, they are spelled out ("that is", "for example", "and colleagues", "and so on", "per cent").
- Acronyms are used only for important terms used several times in the text. Avoid too many acronyms, as it makes the text heavy to read.
- Add links to find the original website or source of information (preferably an English version of the information if available). Be certain that the links are valid.

3.2 Formatting

- For most of the content, there are no headlines and just paragraphs. Use 'Body' as style.
- There are three levels of section headings (H1, H2 and H3), which is used in content about Guidelines and Lessons learnt as described in Table 2.
- Note that you can also find this information in the miniExtensions form for authors.

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11.5 INTERVIEW GUIDE AND TEMPLATE FOR ANALYSIS

Table 16. Interview guide and template

Information to ENGAGE partner conducting interview			
This template is a combined interview guide and template. You can use it as both simultaneously, or insert data in the template afterwards. Grey boxes are more structured questions, whereas questions in the white boxes are more semi-structured. This means that you can modify according to their relevance in the interview. Actually, it would be beneficial that based on your knowledge about the solution, you add/revise specific relevant questions. The text in bold is questions expected to be answered, and text underneath without bold is guidewords and questions for help if needed. It is important that the informant is given the opportunity speak freely about experiences from the use case. In principle the informant is expected to be experienced in a *use case* – a particular application of a solution in a region (e.g. Preparedness Guard in region Trøndelag in Norway). If the informant has experience from several applications, he/she should be encouraged to reflect on his/her total experience.			
Part 0: Intro and informant			
[Give the informant an introduction to the project and the interview incl. ethical & data aspects & provide ENGAGE information sheet and consent form. The interview will be recorded for project internal purposes, if the informant consents. Personal data will not be shared across partners in the project. Inform that analyzed descriptions based on interviews will be published in the knowledge platform of the project, but it will not be possible to identify individuals or used direct quotes/citations of text, unless explicitly asked for it to you.] Suggested intro: Through the EU-project ENGAGE (Engage Society for Risk Awareness and Resilience) we are gathering information on what we call *solutions* – which could be described as various means for first responders & authorities to enhance interaction with citizens and society. It could be tools, methods, processes, apps or other types, ranging from public warning systems to guidelines on how to involve volunteers in preparedness work for example. A core objective in this information gathering is to learn about their applications, specifically knowing more about the context it has been applied, and the lessons learned. We hope that we through this can create knowledge on promising and valuable solutions that can lead other countries and regions to perhaps adopt these solutions. So today, you are invited to speak about solution X and your experience and reflections on it.			
What is your position?		How long have you been working within the field	

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		(Experience level)	
Your organization		Type of organization	
What is or has been your role in use or implementation of solution:			
Part 1: Solution			
Tell us about [the solution]: What is the purpose of the solution? What targets and/or aims has the solution?			
Why did you select this solution? Take it from the start and tell us how and why you chose this solution. Did you select between others, if so, what were the criteria? Why did you choose/develop this solution? Where did you find it?			
Part 2: Implementation experiences – lessons learned			
Could you tell us about the implementation process and what you learned during this process?			
Were there any challenges in the implementation process? If so, how did you approach them? If you were to implement it again – is there anything you would do differently?			

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Which factors (contextual aspects) would you regard as most important for how the successful implementation of the solution? (Refer to the list of contextual factors for implementation/use at the end of this document)	
Has the solution been changed based on lessons learned from use? - If so, can you elaborate on how?	
Part 3: Context of use	
Could you tell us about your organization and the role it plays in your society? How do you think this influences the outcome of [the solution]?	
Could you tell us about the area, region or culture that you are operating within, and the aspects that are relevant for the use of such tool? (Guide words): Typical aspects: size of city/area, sociodemographic – age / gender / minority / etc, Topography, Digital literacy, Social bonds & networks, resources/material, Religiosity, Risk awareness, Trust, General Preparedness level, Risk level etc.	
Which factors (contextual aspects) would you regard as most important for how the solution works? (Refer to the list of contextual factors for implementation/use at the end of this document)	

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One aim of the project is to provide recommendations for use of solutions in other countries and context. Do you have any remarks on what would be especially important to consider for this solution?	
Part 4: Outcomes of the application of the solution	
Has the solution been evaluated? What were the benefits of applying the solution? In terms - of cost - influence on risk or preparedness - of achieving the aims … How *should* this solution be evaluated?	
If possible to estimate, how resource intensive is the solution? In terms - of cost - of personnel needed	
Has the solution been used in a crisis? If so, what was the outcome of using the solution? - before, during, after? - what actions of citizens did it facilitate?	
Part 5: Close the interview	

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Is there anything else you would like to add that we haven't covered? Thank you very much for your time! Can we contact you again if we would like more information?	

Part 6: Analysis (for the researchers to fill in)
On the *solution* itself answer these parameters briefly. Degree of *transferability* to another contexts: Degree of *modifiability* of the solution: Relevant contextual & target aspects (from list below): Additional/new contextual & Target aspects: Coping actions relevant: Other comments and notes:

Created by:	<researcher(s)>	Date:	<date>

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Table 17. List of important factors for implementation/use

Situational contextual factors: Conditions that enable immediate coping actions during an adverse situation.	
Propinquity: proximity in time and space and as closeness, emotional affinity to the event.	
Threat perception: perception of likelihood, severity and intrusiveness.	Also covers: Risk awareness Perception of response
Level of alert and preparedness: form of situational response perception and situational risk awareness	Also covers: Sense of preparedness Actual preparedness Access to training Preparation and planning Organisation's willingness to participate in the exercise Response capacities of the organizations involved in the exercise
Individual background: Conditions that explain coping actions with individual capacities, social positions and beliefs.	
Beliefs	Also covers: Religiosity Perception of responsibility
Coping skills: All the relevant skills for engaging in efficient coping actions.	Also covers: Digital literacy
Level of trust: Level of trust in other individuals or social groups.	
Family status: Size of household and number of children	
Socio-economic status: a combination of individual level of education, income, and occupation.	Also covers: Digital literacy
Gender	
Disabilities	
Local environment: Conditions that structure coping actions on a local level.	
Communality: strength of social bonds and the extend of social networks in a community.	Also covers: Size of community

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Topography: physical access or possibility to evacuate the crisis affected area.	Also covers: Geography
Society: Conditions that enable coping actions and that refer to the structure of society.	
Socio-economic conditions: a combination of collective level of education, wealth and access to resources.	Also covers: Material conditions
Demographic conditions: the demographic characteristics of the affected population, such as age and ethnicity.	
Cultural conditions: norms and beliefs in a wider social group. This includes gender roles	
Organisational context	Also covers: Management structure Relationship between actors (e.g., NGOs, first responders and authorities) Collaboration capabilities Organisation's sense of responsibility Informality and crisis management Internal backing

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11.6 FORM FOR SELECTING IN-DEPTH CHARACTERISATION

Table 18. Form used to evaluate solutions for in-depth characterization.

Prioritization results | Use this data

Hide fields | Filter | Group | Sort

	Solution name	ID	Solution type	Relevance (from Dec 20...	Prioritization score	Knowledge (from Dec 2...	Person to be contacted (...
1	TrygFonden Hjerteløber (H...	29	App	3, 3, 2, 3	11	✓✓	(), david fredman (david@h...
2	Staying Alive	28	App	3, 3, 2, 2	10		
3	Civil Guard	79	Community ambassadors	3, 2, 3	8		
4	Resource Volunteer Manag...	25	App	3, 2, 2	7		
5	AlertCops	24	App	2, 3	5		
6	Fire Risk Awareness Campa...	35	Awareness campaigns and ...	2, 1, 2	5		
7	Community opinion leaders	77	Community ambassadors	2, 3	5		
8	Applying TimeBank	87	Community of practice	2, 1	3		
9	The vigías volunteer network	78	Community ambassadors	3	3		
10	Online memories after eart...	147	Inclusive or psychological s...	3	3		
11	KATWARN	31	App	3	3		
	EVapp	17	App	3	3		
13	PublicSonar	163	Web service or other digita...	3	3		
14	INR-T (information campai...	39	Awareness campaigns and ...	1, 2	3		
15	My EMS (MDA)	22	App	3	3		
16	IBERO Protocol	96	Guidelines and plans	2	2		
17	Stroke 119	27	App	2	2		
18	"City Connect" (in Hebrew)	7	App	2	2	✓	Ayala Bloch (ayalabl@shiku...
19	Corona Dashboard	11	App	2	2		
20	EUSKALMET App	16	App	2	2		
21	The Kubik Educational Prog...	47	Awareness campaigns and ...	2	2		
22	Hyogo Framework for Action	92	Guidelines and plans	2	2		
23	Information hotlines (Call ...	66	Call centre	2	2	✓	Ayala Bloch (ayalabl@shiku...
24	Covid-19 Self-Report	26	App	2	2		
25	DSU Mobile App	13	App	2	2		
26	The regional school tsuna...	34	Awareness campaigns and ...	1	1		
27	LazioAdvice	19	App	1	1		
28	DRIVER+	162	Incentives	1	1		
29	Corona Guardian	80	Community ambassadors	1	1		
30	Emergency preparedness i...	101	Guidelines and plans	1	1		
31	Applying Second Life	90	Web service or other digita...	1	1		
32	Making Cities Resilient 203...	93	Guidelines and plans	1	1		
33	Rescuers from passion	84	Community ambassadors	1	1		
34	Dopomoha (support platfo...	173	Web service or other digita...		0		
83 records				Sum 103	Sum 103		

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11.7 Detailed analysis of the impact of contextual factors

The following tables describe the impact of specific contextual factors for all solutions that were characterised in-depth. The factors are organized by the large categories used throughout this document. Both impacts of Implementation (I) or Use (U) are considered.

11.7.1 Situational factors

Table 19. Detailed description of contextual factors: situational factors

Contextual factor	Solution	Impact	Type
Propinquity - Spatial and temporal proximity	HartslagNu (HeartbeatNow)	The civilian first responders close to the incident location can provide help quickly before the arrival of the ambulance. The number of responders to be notified and the size of the area should be configured based on experience.	U
	TrygFonden Hjerteløber (Heartrunner)		
	Red Cross Preparedness Guard	Spatial proximity influences the type of coping actions that are needed during an emergency. For example, in the case of energy blackouts, transport and provision of food and other goods to remote areas or areas harder to reach may be arduous.	U
Threat perception	TrygFonden Hjerteløber (Heartrunner)	Changing people perception of the risk of cardiac arrest and responsibility when cardiac arrest occurs is the first step towards recruiting citizen responders. It is important that citizens understand that cardiac arrest can affect everyone, that it is essential to help, that anybody can help, that nobody can do something wrong when doing CPR.	I
	Community opinion leaders	How a community perceives a threat can impact the effectiveness of community opinion leaders in crisis management. If a threat is perceived as high, community members might be more likely to heed the guidance of community leaders in order to mitigate the perceived risk. Conversely, if the threat is perceived as low, community members may be less responsive, presenting a challenge for leaders in effectively managing the crisis.	I

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	The Communities Advancing Resilience Toolkit (CART)	The effectiveness of the solution is shown through the implementation of identified actions and increased resilience. High thread perception will support the adaptation of identified measures.	U
Risk awareness	HartslagNu (HeartbeatNow)	Citizens should understand the risk related to heat arrests to be willing to join as civilian first responders.	I
	TrygFonden Hjerteløber (Heartrunner)	Changing people perception of the risk of cardiac arrest and responsibility when cardiac arrest occurs is the first step towards recruiting citizen responders. It is important that citizens understand that cardiac arrest can affect everyone, that it is essential to help, that anybody can help, that nobody can do something wrong when doing CPR.	I
	Community opinion leaders	The level of risk awareness within a community can influence the effectiveness of community opinion leaders in crisis management. Higher risk awareness can lead to quicker and more thorough response to crisis directives.	I
	My112	It is relevant for citizens to acknowledge the degree of relevance that features such as tracking may provide in case of an emergency. Citizens may not be fully aware of the dangers of not having a timely and efficient response from emergency services.	U
	City Connect	A community's risk awareness can influence the effectiveness of the app. Communities with high-risk awareness may be more likely to download and use the app regularly.	U
	School training campaigns	Raising awareness of the risks associated with the internet makes students more cautious in their online practices and more open to following recommendations and advice.	U
	The Communities Advancing Resilience Toolkit (CART)	The effectiveness of the solution is shown through the implementation of identified actions and increased resilience. High risk awareness will support the adaptation of identified measures.	U
	European Emergency Number	Citizens may not be fully aware of the dangers of not having a timely and efficient response from emergency services.	U

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Perception of responsibility	Ertzaintza App	The app allows citizens to send pictures and videos at any time, if the perception of responsibility is high, they will use more the app. Dissemination campaigns are needed to support the uptake of the app by citizens.	I, U
	TrygFonden Hjerteløber (Heartrunner)	Changing people perception of the risk of cardiac arrest and responsibility when cardiac arrest occurs is the first step towards recruiting citizen responders. It is important that citizens understand that cardiac arrest can affect everyone, that it is essential to help, that anybody can help, that nobody can do something wrong when doing CPR.	I
	Red Cross Preparedness guard	Perception of responsibility is also important with regards to the expectations citizens have to the Red Cross. In Norway, the RC are expected to be visible and to participate in emergency situations.	I, U
	The Enabling Social Action Programme	The stronger the perception of responsibility for each other in a community the more people will be participating in social actions.	I
			I
	30days30ways	Preparedness should be proactive. The perception of responsibility for preparedness and resilience are best built little by little as part of everyday life. For instance, a best practice is represented by the LIVE preparedness games every day in September addressing diverse topics, sharing advice and resources.	U
	Be ready caravan	Romania is vulnerable to earthquakes and floods, and the general population do not know how to respond to emergency situations. The solution responds to a need for education on how to prevent and how to be prepared for natural disasters. Surveys performed by Romanian authorities, state that people are interested in getting information about preparedness, but do not do anything to find this information themselves through search for information online or other channels. Thus, in 2016 the caravan was created as a means of approaching people and improving knowledge.	U
	The Communities Advancing Resilience Toolkit (CART)	Increased perception of responsibility will facilitate the successful implementation of identified actions.	U

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	Social media strategy for scientific communication	For the strategy to be successful it is important to bear the responsibility that follows, and that dedicated resources are provided to ensure short response time and that comment sections are not left unmanned.	U
	European Emergency Number	Bystanders need to feel responsible for calling the emergency number and reporting other crisis victims.	U
Level of alert and preparedness	HartslagNu (HeartbeatNow)	Civilian first responders should preferably have CPR training.	I
	TrygFonden Hjerteløber (Heartrunner)	Civilian first responders should preferably have CPR training. Although not mandatory in Denmark, people who sign up as citizen responders have training. CPR training increases confidence in the ability to provide help.	I
	Community opinion leaders	The community's overall level of alertness and preparedness can impact how well they respond to instructions from community leaders during crises.	I
	City Connect	The community's level of alert and preparedness can influence the use and effectiveness of the app. If the community is already aware of and prepared for potential crises, they may be more likely to utilize the app during emergencies.	U
	European Emergency Number	Users need to be alert for using the emergency number.	U
Sense of preparedness	Community opinion leaders	If a community feels well-prepared for a crisis, they are more likely to respond effectively to directives given by their opinion leaders.	I
	City Connect	A community's sense of preparedness can influence the effectiveness of the app. If community members feel prepared and informed, they are more likely to utilize tools like the app in times of crisis.	U
	Be Ready Caravan	Romania is vulnerable to earthquakes and floods, and the general population do not know how to respond to emergency situations. The solution responds to a need for education on how to prevent and how to be prepared for natural disasters. Surveys performed by Romanian authorities, state that people are interested in getting information about preparedness, but do not do anything to find this information themselves through search for information online or other	U

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		channels. Thus, in 2016 the caravan was created as a means of approaching people and improving knowledge.	
	The Communities Advancing Resilience Toolkit (CART)	An awareness of how prepared a community is for potential threats will support the adoption of needed actions.	U
Actual preparedness	Community opinion leaders	The success of using community opinion leaders in crisis management heavily depends on the actual preparedness of both the leaders and the community they represent. This includes having pre-established communication channels, understanding of emergency procedures, and ability to mobilize resources effectively.	I
	Community opinion leaders	The effectiveness of community leaders in managing emergencies can be significantly influenced by the actual preparedness of the community and its leaders. This encompasses having the necessary skills, information, resources, and plans for handling various types of emergencies.	U
	HartslagNu (HeartbeatNow)	Maintaining knowledge about CPR is useful when providing help.	U
	Red Cross Preparedness guard	In terms of actual preparedness, and for the Preparedness Guard to be effective, it is necessary to have the right volunteers available for a long enough time. This is important for the solution to be able to grow and for the system not becoming person dependent.	U
	Social media strategy for scientific	It is important to have dedicated resources that are responsible for the social media accounts to be able to do a good job during normal activity. In the event of a crisis, there should be a preparedness plan that ensures that more people can be recruited to the social media team – either from own ranks or temporarily recruited from outside the organisation.	U

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11.7.2 INDIVIDUAL BACKGROUND

Table 20. Detailed description of contextual factors: individual background

Contextual factor	Solution	Impact	Type
Beliefs	City Connect	Individual and communal beliefs can shape the use and effectiveness of the app. For example, communities that place a high value on communal cooperation and shared responsibility may adopt and utilize the app more readily.	I
	Community opinion leaders	The beliefs of a community can significantly influence how they respond to crisis management strategies. For example, communities with strong beliefs in communal support and mutual aid may be more receptive to initiatives led by their opinion leaders.	I
	Community opinion leaders	The shared beliefs of a community can shape how community leaders communicate and manage a crisis. For example, leaders may need to frame information and actions within the context of these beliefs to increase compliance and cooperation.	U
Religiosity	Community opinion leaders	Understanding the cultural norms, values, and practices of a community can help customize the approach to crisis management. Leaders who are ingrained in these cultural conditions can provide more effective guidance	I
	City Connect	The level of religiosity in a community can also affect the use and effectiveness of the app. Consideration should be given to how religious beliefs and practices might influence the way information is received and acted upon.	U
Coping skills	HartslagNu (HeartbeatNow)	Knowledge about CPR and AED is important. Making CPR training easily available can contribute to more volunteers. Digital literacy is also essential as the system is app-based.	I
	TrygFonden Hjerteløber (Heartrunner)	Health professionals are more inclined to join. This might be exploited during the initial launch of the approach. Knowledge about CPR and AED is important. Making CPR training easily available can contribute to more volunteers. It is important to provide links to web pages where volunteers can see videos and read information.	I

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	Red Cross Preparedness Guard	It is necessary to have a person from the more established groups of volunteers with relevant coping skills to organize the volunteers from the preparedness guard in emergencies.	I
	Community opinion leaders	The ability of individuals and the community as a whole to manage stress and adversity can impact the effectiveness of using community opinion leaders in crisis management. Leaders who can encourage resilience and coping can be more successful.	I
	Community opinion leaders	The coping skills of both the leaders and community members can influence the effectiveness of crisis management. Leaders who can manage stress and make sound decisions under pressure can guide their community more effectively.	U
	Civil guard	The coping skills of the Civil Guard volunteers play a pivotal role in their interactions with the community and their performance during crises. Given their responsibilities, like managing traffic post-evacuations, their ability to remain calm, make swift decisions, and effectively cope with stressful situations ensures the community's safety and orderliness. Continuous training and mental health support for these volunteers can further enhance these skills, making the Civil Guard even more effective during high-pressure scenarios.	U
	Norwegian Index for Medical Emergency Assistance	The personnel in emergency call centres need to be educated in the health or medical field to be able to use the index in the proper and correct manner. The relevant education lays the foundation for the use of this index and ensures that the right help is sent to the education site.	U
Digital literacy	Basque police App (Ertzaintza app)	A minimum knowledge of technologies is required (for users). This should be considered during implementation.	I
	My112	A minimum knowledge of technologies is required (for users). Users must be familiar with this sort of app in the app stores (iOS and Android). Furthermore, despite its simple interface, citizens must know how to activate the tracking system in the app and know which buttons to press in case of an emergency. This should be considered during implementation.	I

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	City Connect	Digital literacy is a crucial factor for the successful implementation of the City Connect app. The end-users, which are the citizens, need to possess the necessary skills to use the app effectively. This includes understanding how to download the app, navigate its features, and interpret the information provided. Therefore, before deploying such a solution, it would be beneficial to assess the level of digital literacy within the target population and provide support or training as needed.	I
	Crisis information website	For this solution to work properly in a society, the population needs to be digital literate. The digital infrastructure needs to be in place, and people need access to the internet. For the information to come through, large parts of the population should own a phone, tablet or a computer, and know how to use it. This is not a prominent issue in Sweden, but certain groups with lower degree of digital literacy might be affected (such as elderly people).	I
	PetaBencana	Citizens should have a minimum level of digital literacy and access to infrastructures, such as the internet and gadgets (smartphones, tablets, etc.).	I
	Dopomoha (support platform for refugees)	All requests and offers, in addition to communication, are done through web platforms or other types of digital systems. Accordingly, there needs to be a certain degree of digital literacy in order to make use of the platform.	I
	30days30ways	High digital literacy is important as this solution is applied only online. Organisations implementing this solution should be in condition to design messages that align with the public needs.	I
	Community opinion leaders	In an increasingly digital world, the ability of community opinion leaders to effectively use digital tools for communication is critical.	I
	VOST (Virtual Operations Support Teams)	The solution targets social media and is, therefore, dependent on digital literacy skills both from volunteers and from populations that seek, share or respond to information provided online. Volunteers also need the necessary skills to find official and trustworthy sources for information and provide it in a comprehensive way.	I
	RO-alert system	Basic digital literacy is required to operate the system for public authorities.	I
	Everbridge Public Warning	Basic digital literacy is required to operate the system for public authorities.	I

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	Basque police App (Ertzaintza app)	A minimum knowledge of technologies is required. The app will be used by those citizens accustomed to using new technologies such as mobile applications in their day today. Therefore, those with little technological knowledge are less likely to use the app.	U
	TrygFonden Hjerteløber (Heartrunner)	It should be very easy to sign up and use the app.	U
	City Connect	Digital literacy is key for the successful use of the app. Efforts should be made to ensure all community members, regardless of their level of digital literacy, can access and understand the information provided by the app.	U
	Dopomoha (support platform for refugees)	All requests and offers, in addition to communication, are done through web platforms or other types of digital systems. Therefore, the use of the platform requires a certain degree of digital literacy. At the same time, the Dopomoha platform has been developed with the user in mind, making it intuitive and easy to use.	U
	Community opinion leaders	In the age of information technology, the effectiveness of community leaders can be significantly enhanced if they, and their community, have a good level of digital literacy. This can enable more effective communication, coordination, and information dissemination during a crisis.	U
	VOST (Virtual Operations Support Teams)	VOST needs to be adapted to the digital literacy and communication skills of the general population. Messaging has to be clear and simple. VOST mostly relies on information from official channels and needs to convince authorities of the importance of information sharing parallel to official disaster communication channels.	U
	RO-Alert system	Access to a cell phone is required to receive the message.	U
	Everbridge Public Warning	Apart from the warning, people can engage in two-way communication with public authorities. To do so, access to a cell phone or computer is needed. Basic digital literacy is therefore required.	U

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Access to training	TrygFonden Hjerteløber (Heartrunner)	Health professionals are more inclined to join. This might be exploited during the initial launch of the approach. Knowledge about CPR and AED is important. Making CPR training easily available can contribute to more volunteers. It is important to provide links to web pages where volunteers can see videos and read information.	I
	Civil Guard	Context-Specific training: The training needs to be tailored to the specific challenges and needs of the local context. For example, the nature of emergencies the force may have to respond to can differ vastly from one region to another, and so can the security challenges. Therefore, the training should equip the civil guard members with the necessary skills and knowledge that cater to their specific operational environment.	I
	Civil guard	The effectiveness of the Civil Guard is significantly influenced by the training they receive. Being a mix of police personnel and civilian volunteers, it's essential that everyone has a clear understanding of their roles, responsibilities, and the best practices to follow. Comprehensive, accessible, and up-to-date training ensures that the Civil Guard is equipped to deal with daily activities and larger events like disaster evacuations. Ensuring regular training sessions, refresher courses, and updates on changing protocols can boost the confidence and capability of the volunteers, leading to more effective outcomes in their duties.	U
	Social media strategy for scientific communication	Persons involved in a social media team should be familiar with the social media platforms in question. Furthermore, it will be important to have training available with specific instructions and guidelines for the work.	I
	Norwegian Index for Medical Emergency Assistance	The personnel using this index need a certain amount of training before using the index to be able to use it efficiently.	U
Level of trust	Crisis information website	As mentioned above, a prerequisite for this solution is that the population has a certain degree of trust in authorities. All of the information on the web portal is from Swedish authorities. Without trust in authorities, the information on the web pages is useless and can contribute to conspiracy theories.	I

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	The Communities Advancing Resilience Toolkit (CART)	The level of trust in the entity that proposes the initiative needs to be high. This is because the level of trust will influence the willingness for adaptation.	I
	Community opinion leaders	Trust in community opinion leaders is a vital factor in this solution's success. Leaders who have earned the community's trust can disseminate information and guidance more effectively.	I
	Community opinion leaders	The degree of trust that community members have in their leaders plays a pivotal role in how effective these leaders can be during emergencies. Higher levels of trust often result in better cooperation and compliance with leaders' directives.	U
	VOST (Virtual Operations Support Teams)	Depending on the trust people have in authorities VOST can be closely linked to authorities or operate as independent volunteers. The trust authorities and emergency organizations have in VOST groups is pivotal for collaborating during crises.	I
	VOST (Virtual Operations Support Teams)	VOST depends on pre-existing information on social media and directly from authorities and emergency organizations. For the first trust from social media users and being recognized as independent actor is necessary for being able to relate and amplify official information and deconstruct misinformation. For the latter trust relationships with official crisis managers is necessary to obtain pivotal information.	U
	Basque police App (Ertzaintza app)	If the citizens do not trust the authority, they will not use the app.	U
	My112	Citizens should trust that the tracking information they provide during the last 10 days is vital to know the whereabouts of the citizen in case of an emergency. If the citizens do not trust the authority, they will not use the APP.	U
	City Connect	The trust that the community has in the organization managing the app is vital. Higher trust levels can result in more widespread use and effectiveness of the app.	U
	School training campaigns	If the students do not trust the authorities are less willing to take their recommendations.	U

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	Red Cross Preparedness Guard	Level of trust is important for the use of the Preparedness Guard. Based on experiences, volunteering for the authorities is not considered something that people want to do. The message and legitimacy will be different if the Preparedness Guard is organised by authorities. The impression is that the one next to you should also work for free. Therefore, volunteer centrals arranged by the municipality for example, have worked modestly and never been a great success.	U
	Civil guard	For the Civil Guard to be effective, trust is an essential element. Residents need to trust this subdivision of the Israeli police force as they are often the first point of contact in daily police activities and during crises. The volunteers, though civilians, wear a mantle of authority and their actions reflect the entire police force. When the community holds a high level of trust towards these volunteers, cooperation is heightened, ensuring smoother operations. Regular, transparent communication and community outreach by the Civil Guard can strengthen this trust over time.	U
	Social media strategy for scientific communication	In general, Norwegian authorities enjoy a high level of trust in the Norwegian population. This high level of trust is presumed to play a role in enabling the Norwegian Institute of Public Health (NIPH) to be open about uncertainty with regards to for example the Covid-19 pandemic. Moreover, during the pandemic, the NIPH was approached by both Facebook Norway and Twitter Norway to be the official source for Covid-19 information, which they accepted. On the one hand, a high level of trust is a good point of departure for communication on social media. On the other hand, less trust can also enable social media users to be critical and ask questions. Overall, an aim has been that the work should amplify the perception of the organisation as a trustworthy source of information.	U
	Ro-Alert system	Populations need to trust the alert message provider. Distrust can lead receivers to misinterpret or ignore the alert messages.	U
	Everbridge Public Warning	Populations need to trust the alert message provider. Distrust can lead receivers to misinterpret or ignore the alert messages.	U
	European Emergency Number	Users need to trust the emergency services in their country to be incentivized to call them in case of emergency.	U

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Family status	Community opinion leaders	Family dynamics, such as the presence of children or elderly family members, can affect how crisis information is perceived and acted upon.	I
Socio-economic status	TrygFonden Hjerteløber (Heartrunner)	The solution needs to be adapted to areas with low socio-economic status and high degree of ethnic diversity. Inhabitants in such areas tend to not use the emergency services. They often call their family first. An intervention is currently going now with teaching what cardiac arrest is, what CPR is in multiple languages, as well as tracing AEDs. Research is also currently conducted in Denmark to investigate if there are communities or municipalities with low participation and, for those, to design an approach to reach them.	I
	City Connect	Access to smartphones and internet services may not be universal, particularly in economically disadvantaged communities. As such, alternate or complementary modes of information dissemination may be needed to ensure that all citizens have access to critical information.	I
	City Connect	Socio-economic status can influence the use and effectiveness of the app. While the app can be a useful tool for sharing information quickly, it may be less accessible to those with limited access to technology or internet services due to financial constraints. Thus, the socio-economic status of the community should be considered in the implementation and use of the app.	U
	Community opinion leaders	The socio-economic status of a community can influences the resources available for crisis management and the community's overall responsiveness to crisis instructions.	I
	Basque police App (Ertzaintza app)	Citizens require a minimum of knowledge about technologies, and resources to buy the technologies and associated services.	U
Gender	Red Cross Preparedness Guard	The volunteers were often 50+ and Caucasian, white and some who volunteers/organized from before in other areas. In psychosocial care, gender plays a role as these volunteers are often 50+ women Caucasian.	I

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	Community opinion leaders	In certain cultures, gender can play a significant role in defining the acceptability and effectiveness of community opinion leaders.	I
	City Connect	Gender can impact the use of the app. Efforts should be made to ensure the app is accessible and useful to all genders.	U
	Civil guard	Gender plays a pivotal role in the dynamics and effectiveness of the Civil Guard. Ensuring that there is balanced gender representation within the Civil Guard can lead to a broader range of perspectives and approaches to problem-solving. Furthermore, in a society as diverse as Israel's, having both male and female volunteers can ensure more sensitive handling of gender-specific issues or scenarios that might arise, whether it's during routine duties or crisis situations. Gender equality and sensitivity training, as well as policies promoting the active inclusion of women in leadership roles within the Civil Guard, can further enhance the organisation's effectiveness and the community's trust in it.	U
Disabilities	Ro-Alert system	Inclusivity and accessibility: Ensuring the inclusivity and accessibility of a cell broadcast-based public warning system. It is important to consider factors such as language diversity, accessibility features for individuals with disabilities, and reaching vulnerable populations to ensure that everyone can receive and understand emergency alerts.	U

11.7.3 SOCIAL BONDS

Table 21. Detailed description of contextual factors: social bonds

Contextual factor	Solution	Impact	Type
Social bonds	Community opinion leaders	Strong social bonds within a community can amplify the effectiveness of community opinion leaders, as people are more likely to support initiatives that protect their community.	U
	The Enabling Social Action Programme	Social bonds between community members will increase participation in social actions.	U

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Communality	The community emergency and resilience team	Representatives from all socio-economic status, religions, work background and other demographic characteristics are relevant for inclusion in the CERTs. As it's 'people for the people' based, the inclusion criteria are very encompassing. One important criterium that must be respected is the belonging of the volunteers to the CERT of their own community. This is intrinsic to CERTs success.	I
	The community emergency and resilience team	The representation of all sects of the community's society is crucial to enhance trust and confidence in the CERTs. Thus, recruitment of volunteers to the CERTs must be done with the utmost sensitivity and consideration of all groups that the community consists of. Special care should be given to include representation of all religious affiliations, as well as the varied levels of religiosity (secular, traditional, and religious groups).	U
	Civil Guard	The Israeli Civil Guard model heavily relies on community involvement. The effectiveness of this model largely depends on how well the force is embedded within the community it serves. Engaging community members not only in the establishment but also in the operations of such a force is crucial. The model is more effective when there is mutual trust and cooperation between the community and the civil guard force.	I
	Civil Guard	Given that the Civil Guard is deeply rooted in the community - being composed of civilian volunteers - a sense of communality can greatly amplify its effectiveness. When these volunteers are seen not just as enforcers but as neighbours and fellow citizens, the community is more likely to cooperate and support their efforts. Celebrating the shared purpose and mission of the Civil Guard and the community they serve can foster this sense of unity, encouraging a more harmonious relationship and mutual support during challenging times.	U
	Community opinion leaders	A strong sense of community can boost the effectiveness of community opinion leaders in crisis situations. When people feel a part of a collective, they are more likely to comply with guidelines and directives given by their leaders.	I
	Community opinion leaders	Strong communal ties and a shared sense of identity can enhance the effectiveness of community leaders. This communal spirit often leads to higher levels of cooperation, trust, and shared responsibility during crises.	U

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	The Enabling Social Action Programme	A strong sense of community is important for participation in social actions.	I
	HartslagNu (HeartbeatNow)	There are fewer civilian first responders in rural areas than in urban areas, but the acceptance rate is higher in rural areas than in urban areas.	U
	TrygFonden Hjerteløber (Heartrunner)	When the program was first launched in Copenhagen and the capital region, the emergency services doubted people would sign up. The solution was anticipated to be better suited for rural areas, where people expect the ambulance arrival to be long and where people know their neighbours. Surprisingly, many people signed up in Copenhagen within a few months.	U
	Social media strategy for scientific communication	A sense of team spirit is evaluated as beneficial, both to ensure a coherent approach to social media work and an informal arena to discuss and air frustrations and challenges.	U
Size of the community	Red Cross Preparedness guard	Depending on the size of the community in which the solution is implemented, different recruiting strategies must be used. In larger communities, a more thorough assessment process of volunteers is needed, for example existing volunteers who have already been approved to work as volunteers are recruited rather than ordinary.	I
	Community opinion leaders	The size of the community can impact the approach of community opinion leaders. Smaller communities might have more personal relationships, while larger communities may require broader, more generalized strategies.	I
	City Connect	The size of the community can impact the use and effectiveness of the app. Smaller communities may be able to rely on more traditional forms of communication, while larger communities may find an app like City Connect invaluable.	U
	Community opinion leaders	The size of the community can affect the leaders' effectiveness. In smaller communities, leaders may have a more personal relationship with community members, which can aid in efficient communication and cooperation. In contrast, larger communities may require more complex coordination efforts.	U
Geography	Be Ready Caravan	Romania has 42 inspectorates and is a big country. However, the visits of the caravan are not planned according to regions but on the number of citizens that	I

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		could potentially be reached by a visit. The first visits were scheduled in densely populated areas, and then rural areas were visited.	
	Ro-Alert system	Geographical information is needed to test the device in a given area.	I
	Ro-Alert system	The cell broadcast system needs precise geographical information of the affected area. An ill-defined area can leave victims without alerts or provoke unnecessary reactions of populations that are not affected by a crisis event. Thus, to be effective, the system needs access to precise geographical information.	U
	Everbridge Public Warning	Geographical information is needed to test the device in a given area.	I
	Everbridge Public Warning	The cell broadcast system and the localized alert messages need precise geographical information of the affected area. An ill-defined area can leave victims without alerts or provoke unnecessary reactions of populations that are not affected by a crisis event. Thus, to be effective, the system needs access to precise geographical information.	U
	Community opinion leaders	The geographical context, such as the size and layout of a community, can influence how community leaders operate. For instance, in a spread-out rural community, leaders may face additional challenges in communicating and coordinating responses compared to leaders in a compact urban setting.	U
Topography	Red Cross Preparedness guard	Topography influences the type of coping actions that are needed during an emergency. For example, transport is harder to implement in areas that are hard to reach.	U
	Community opinion leaders	The physical characteristics of the community's location can present unique challenges or advantages to community leaders during emergencies. Leaders in communities with challenging topography may need to implement more specialized strategies to ensure effective communication and coordination.	U

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11.7.4 SOCIETY

Table 22. Detailed description of contextual factors: society

Contextual factor	Solution	Impact	Type
Cultural conditions	The Communities Advancing Resilience Toolkit (CART)	Important for implementation is that the targeted communities are able to act together. Cultural beliefs can influence the predisposition to collaborate.	I
	Civil Guard	Socio-political considerations: It is important to consider the socio-political context in which the civil guard will operate. Potential friction with certain communities, cultural differences, and existing security situations are factors that may influence the implementation and operation of the civil guard. Understanding and navigating these factors are key to successfully implementing this model.	I
	Community opinion leaders	Understanding the cultural norms, values, and practices of a community can help customize the approach to crisis management. Leaders who are ingrained in these cultural conditions can provide more effective guidance.	I
	Ro-Alert system	Ensuring the inclusivity and accessibility of a cell broadcast-based public warning system. It is important to consider factors such as language diversity, accessibility features for individuals with disabilities, and reaching vulnerable populations to ensure that everyone can receive and understand emergency alerts.	I
	TrygFonden Hjerteløber (Heartrunner)	No CPR training is required to sign up. Rather videos about CPR and opportunities for training are shared with the volunteers.	U
		The solution needs to be adapted to areas with low socio-economic status and high degree of ethnic diversity. Inhabitants in such areas tend to not use the emergency services. They often call their family first. An intervention is currently going now with teaching what cardiac arrest is, what CPR is in multiple languages, as well as tracing AEDs. Research is also currently conducted in Denmark to investigate if there are communities or municipalities with low participation and, for those, to design an approach to reach them.	U

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	City connect	The app should respect and reflect the cultural conditions of the community it serves. Language options, cultural sensitivities, and the types of information shared should be mindful of the community's cultural background	U
	30days30ways	It is central to evaluate both the process and outcomes of the monthly campaign to make sure actions are well targeted and appropriate for the different target groups.	U
Socio-economic conditions	TrygFonden Hjerteløber (Heartrunner)	The implementation of the solution requires a solid infrastructure including software, AEDs and a registry of AEDs. The software has to be integrated with the dispatch centre system. The number of AEDs and the coverage are important. The costs of establishing and maintaining this infrastructure as well as those of promoting the solution are non-negligeable.	I
	TrygFonden Hjerteløber (Heartrunner)	The solution needs to be adapted to areas with low socio-economic status and high degree of ethnic diversity. Inhabitants in such areas tend to not use the emergency services. They often call their family first. An intervention is currently going on now with teaching what cardiac arrest is, what CPR is in multiple languages, as well as tracing AEDs. Research is also currently conducted in Denmark to investigate if there are communities or municipalities with low participation and, for those, to design an approach to reach them.	U
	The community emergency and resilience team (CERT)	Representatives from all socio-economic status, religions, work background and other demographic characteristics are relevant for inclusion in the CERTs. As it's 'people for the people' based, the inclusion criteria are very encompassing. One important criterium that must be respected is the belonging of the volunteers to the CERT of their own community. This is intrinsic to CERTs success. As the CERTs aim to provide response to the needs of the community, representatives of all varied groups that compose the community are vital. A common language, acquaintance, understanding of challenges and constraints, familiarity with potential gaps and resources and more, characterise the members of the CERTs and facilitate their capacity for provision of an effective response.	I

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	Civil guard	The Civil Guard model is resource-intensive. It requires proper funding and resources to ensure the members have access to necessary equipment, training, and infrastructure. These resources are critical in enabling the force to effectively carry out their responsibilities.	I
	Community opinion leaders	The socio-economic status of a community can influences the resources available for crisis management and the community's overall responsiveness to crisis instructions.	I
	Basque police App (Ertzaintza app)	Citizens require a minimum of knowledge about technologies, and resources to buy the technologies and associated services.	U
Material conditions	HartslagNu (HeartbeatNow)	The implementation of the solution requires a solid infrastructure including software, AEDs and a registry of AEDs. The software has to be integrated with the dispatch centre system. The number of AEDs and the coverage are important. The costs of establishing and maintaining this infrastructure as well as those of promoting the solution are non-negligeable.	I
	TrygFonden Hjerteløber (Heartrunner)	The implementation of the solution requires a solid infrastructure including software, AEDs and a registry of AEDs. The software has to be integrated with the dispatch centre system. The number of AEDs and the coverage are important. The costs of establishing and maintaining this infrastructure as well as those of promoting the solution are non-negligeable.	I
	Don't Shake at Earthquake	It has been important to use professionals when making the videos, which has a cost, depending on the company used and number of videos.	I
	Be Ready Caravan (training campaign)	The cost of buying and maintaining such a caravan is relatively high. One should therefore consider available resources.	I
	Red Cross Preparedness guard	Some material conditions and resources are needed. Through cooperation agreements, the municipality is expected to pay for costs (food etc.) related to mobilizing the preparedness guards during emergencies. Administration of the list and the training of citizens is somewhat resource intensive.	I

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	Social media strategy for scientific communication	One should consider available resources that can be dedicated to social media work when implementing a social media strategy. Moreover, in case of a crisis, it is likely that the activity will increase and that extra persons are needed in the social media team.	I
	Social media strategy for scientific communication	It is important to have dedicated resources that are responsible for the social media accounts to be able to do a good job during normal activity. In the event of a crisis, there should be a preparedness plan that ensures that more people can be recruited to the social media team – either from own ranks or temporarily recruited from outside the organisation.	U
	Ro-Alert system	Infrastructure and Network Readiness: The existing infrastructure and network should be assessed for capacity, coverage, and scalability to ensure effective message delivery during emergencies.	I
Demographic characteristics	Don't Shake at Earthquake	The aim of the campaign has been to reach different layers of society. The videos developed for the awareness campaign have been shown on national TV and radio. In addition, the videos have been used in the Be ready caravan and shown in schools in relation to training in first aid skills. Thus, the potential to reach the whole population is high. The response time in case of an emergency is known to be longer in rural than urban areas. In addition, skills and knowledge about preparedness are perceived to be lower in rural areas, thus the government has been particularly concerned with conveying the information to these areas.	I
	Be Ready Caravan (training campaign)	The solution was not targeted at specific ages or groups. However, experience showed that people in rural areas were more interested in and fascinated by the caravan and how it looked inside. In rural areas, a lot of elderly people and children came to have a look at it. In urban areas, the visitors to the caravan were a mix of different categories of people.	I
	The community emergency and resilience team (CERT)	Representatives from all socio-economic status, religions, work background and other demographic characteristics are relevant for inclusion in the CERTs. As it's	I

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		'people for the people' based, the inclusion criteria are very encompassing. One important criterion that must be respected is the belonging of the volunteers to the CERT of their own community. This is intrinsic to CERTs success. As the CERTs aim to provide response to the needs of the community, representatives of all varied groups that compose the community is vital. A common language, acquaintance, understanding of challenges and constraints, familiarity with potential gaps and resources and more, characterise the members of the CERTs and facilitate their capacity for provision of an effective response.	
	The community emergency and resilience team (CERT)	The representation of all sects of the community's society is crucial to enhance trust and confidence in the CERTs. Thus, recruitment of volunteers to the CERTs must be done with the utmost sensitivity and consideration of all groups that the community consists of. Special care should be given to include representation of all religious affiliations, as well as the varied levels of religiosity (secular, traditional, and religious groups)	U
	Community opinion leaders	Demographic factors such as ethnicity, race, and language spoken can influence how community opinion leaders communicate with their community and external bodies.	I
	City Connect	Demographic characteristics such as education level, occupation, and language proficiency can influence the use and effectiveness of the app. Understanding these characteristics can guide the design and implementation of the app to best serve the community's needs.	U
	Civil Guard	Understanding and respecting the demographic characteristics of both the volunteers in the Civil Guard and the community they serve is vital. Israel's diverse society means the Civil Guard will interact with people from various cultural, ethnic, and religious backgrounds. Recognising these diversities and ensuring that the Civil Guard is representative of the community can help in building trust and mutual respect. It also ensures that the Guard can effectively communicate and cater to the unique needs of different demographic groups. Training sessions on cultural sensitivity and inclusivity can help volunteers appreciate and respond to the rich tapestry of the Israeli society.	U

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	Everbridge Public Warning	Whereas the cell broadcast component targets indiscriminately all cell phone users in a specific area, the location-based alert system is based on a predefined user group based on a subscription to the public warning center. Thus, how these subscriptions are gathered and who subscribed to them determines the effectiveness of the solution.	U
Age of the population	30days30ways	While this solution intends to reach society at different ages and raise awareness about possible hazards, it is most likely to reach younger generations as they are usually better versed with technology.	I
	School training campaigns	Younger groups of students are more interested in the talks. The talks have to be adapted depending on the age of the group.	I
	Red Cross Preparedness guard	Age of the population where the solution is implemented is an important factor for what type of actions are required from the volunteers, for example care, shopping, or transport.	I
	Community opinion leaders	The age distribution within a community can impact how information is received and interpreted. Older populations may rely more heavily on traditional communication channels and trusted leaders, while younger demographics might be more digitally oriented.	I
	Basque police App (Ertzaintza app)	Older adults with limited knowledge of new technologies are likely to choose other 'more traditional' communication channels such as emergency phone lines. There seems to be no difference in the use of the app between rural and urban areas.	U
	City Connect	The age demographics of a population can influence the effectiveness of the City Connect app. Younger populations may more readily adopt the app due to their familiarity with digital technology. In contrast, older populations may require more support or alternative solutions. Tailoring the app's user interface to accommodate varying age groups can enhance its effectiveness.	U

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11.7.5 ORGANISATIONAL CONTEXT

Table 23. Detailed description of contextual factors: organisational context

Contextual factor	Solution	Impact	Type
Management	City Connect	The successful roll-out of the City Connect app also requires efficient management. This encompasses the coordination of various departments within the municipality, overseeing the timely and accurate delivery of information, and managing any technical issues that arise. Well-structured management ensures that the app remains a reliable and effective communication tool for citizens during both routine times and emergencies.	I
	Red Cross Preparedness guard	It is resource demanding to recruit and manage many people at the same time. Because there can be a challenge for dropouts, it may also take a lot of time each year to recruit new people. Before implementing the Preparedness Guard, one should consider resources available for management and perhaps limit the number of people that are recruited as volunteers.	I
	Enabling Social Action Programme	Important for its effectiveness is that authorities are willing to adopt the program and that the provided support is in close collaboration with the community and social activities already in place.	U
Internal backing	Social media strategy for scientific communication	It is viewed as important that a strategy should be anchored with the leadership or management of the organisation in question and an understanding of the importance of social media in the organisation in general. Such support will be important if for example more resources are needed to follow up the strategy.	I
	Norwegian Index for Emergency Medical Assistance	One important factor is that there needs to be internal backing within the organisation to implement such a solution. The use of the index and similar tools need to be internally anchored in the management of emergency call centres.	I
	Community opinion leaders	The effectiveness of community leaders is also contingent upon the support they receive from within the community. Leaders who are respected and have strong backing are likely to be more effective in their roles.	U

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Mental support	HartslagNu (HeartbeatNow)	Planning resources to follow- the civilian first responders after an incident is important.	U
	TrygFonden Hjerteløber (Heartrunner)	Following-up the civilian first up responders after an incident is important.	U
Collaboration	HartslagNu (HeartbeatNow)	The implementation and promotion of the system requires a good collaboration between various stakeholders such as national and local health authorities, emergency services, CPR training providers, and AED providers.	I
	TrygFonden Hjerteløber (Heartrunner)	The implementation of the system requires good collaboration between health professionals and other stakeholders that can support promotion, increasing AED coverage and research needed to tune the system.	I
		Support from politicians and authorities: Back-up from politicians has shown to be speed up the adoption in Denmark. Hjerteløber is now on the National board of health. Funding was given to improve the emergency services and volunteers are seen as a part of the program	I
	Dopomoha	Close collaboration between government and NGOs is needed, and communication channels with the possibility of involving up to 1000 members needs to be established.	I
	Dopomoha	There needs to be a well-functioning collaboration between authorities and NGOs in order to organise and coordinate all the requests and people who offers to help.	U
	Be Ready Caravan	Close collaboration between the state, the military and the SMURD service ensures local support, trainers, and volunteers to work on the caravan when it visits a new place. The SMURD service is a distributed organisation that covers the whole country.	I
	Civil Guard	Collaboration and coordination with other security forces and emergency services are vital for the model to function effectively. This includes a well-established communication and coordination system for handling emergencies or security threats.	I

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	Civil Guard	Collaboration is a cornerstone for the effectiveness of the Civil Guard in Israel. Given the unique nature of this organisation — a blend of civilian volunteers and police personnel — seamless collaboration is paramount. This ensures that the volunteers act in alignment with the police force's mandates and with each other, ensuring consistency in their duties, whether it's daily police work or managing traffic during disaster evacuations. Regular joint exercises, communication drills, and collaborative planning between the police and the volunteers can strengthen this synergy, ensuring both groups are on the same page.	U
	Community opinion leaders	Effective collaboration between community opinion leaders, government bodies, and emergency services is essential. Mutual understanding and respect can facilitate efficient communication and response during crises.	I
	Community opinion leaders	The ability of community leaders to collaborate effectively with other entities such as local, regional, or national authorities, NGOs, and emergency services is crucial for the successful management of emergencies.	U
	The Enabling Social Action Programme	A sense of collaboration between community members is important for participating in social actions and volunteering to help others.	I
	Ro-Alert system	Interoperability and Standardization: Common standards and protocols across mobile network operators are crucial for seamless integration and message reception by users regardless of their service provider or device type.	I
	European Emergency Number	For the number to work on an European level, European emergency organisations need to collaborate.	I
	City Connect	The effectiveness of the app can be enhanced through collaboration with other local organizations, businesses, and community groups. These entities can help promote the app, provide feedback, and assist in its evolution based on community needs.	U
	PetaBencana	The platform needs participation and input from the communities to function. It is important to promote public awareness about the program to ensure that the data that is collected from the public is reliable and accurate.	U
	Don't Shake At Earthquake	In order to disseminate the videos to a broad audience, it will be important to have collaboration and agreements with for example TV channels to screen the videos,	U

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		with radio stations to promote them, as well as collaboration with schools and universities to allow training sessions during school time.	
Relationship between NGO and first responders and authorities	Red Cross Preparedness guard	The relationship between NGO and first responders and authorities is important. In Norway, the emergency first responders are often interested in collaborating with the Red Cross as an NGO, and there is an established level of trust between these actors. In areas where there is no collaboration the formal authorities will not contact volunteers.	I
	Community opinion leaders	The nature of the relationship between community leaders, NGOs, first responders, and authorities can significantly impact the effectiveness of the response to emergencies. Positive, established relationships can foster better cooperation and coordination.	U
Marketing	HartslagNu (HeartbeatNow)	Recruiting civilian first responders requires focused campaigns, in particular in the launch phase of the solution. Keeping track of areas with few responders and collaborating with local authorities in these areas can facilitate recruiting more people in these areas.	I
	TrygFonden Hjerteløber (Heartrunner)	To change people mindset requires good stories. It is something that health personal and researchers have not the capacity to do so. Collaboration with an actor that can actively inform people is important. The communication in Denmark was extremely successful. Information is shared though various channels. Marketing is backed up with evidence from research. Five years after launch, everyone in Denmark knows about Hjerteløber.	I
	City Connect	The effectiveness of the City Connect app hinges on the number of people who use it. Thus, marketing efforts play a significant role in its implementation. Awareness campaigns, digital advertisements, and community outreach programs can be employed to promote the app's download and use. The marketing strategy should highlight the app's benefits and its role in fostering a better-connected, safer community.	I
	Dopomoha	Dopo: To increase the awareness of the platform and geographical coverage, it may be in order to spend some resources to plan marketing efforts. This will depend on the outreach possibilities of the solution provider in question and the need for	I

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		marketing. If broader segments of the public are familiar with the platform, it will likely increase the platform's resources in handling different crises.	
	Dopomoha	In order to increase the awareness of the platform among citizens and other target groups (i.e., here refugees), marketing activities can make the platform more visible and effective.	U
	School training campaigns	It is important to make the initiative known to the schools. If the schools do not know that the campaign exists, the solution will not be effective.	I
	30days30ways	Campaigns should be designed with significant creativity to catch citizens' attention and engagement.	U
Preparation and planning	Dopomoha	It was important that the videos were short (30 seconds) because the audience has a short attention span. Also, it is important that the videos are concerned with providing the correct information. Private companies were involved in creating the videos to make them look professional, since professionals know how to convey information in a suitable format. It should be considered that the media used can influence acceptance by the public.	I
	Be Ready Caravan	When it comes to resources in terms of staff, it might be necessary to consider plans for staff empowerment to mitigate or prevent burnout that may be caused by days on the road and being away from home.	I
		A sufficient number of trainers (to train local trainers) is needed. In Romania, 100 trainers rotate doing training.	I
	Be Ready Caravan	Preparation of the visit at least two weeks in advance is paramount. Support from local authorities is needed, also from NGOs and volunteers in promoting the caravan before it arrives and in staffing the caravan with trained instructors when it is there.	U
		Size of event: Institutions, schools and other people are asking for the caravan to visit them. Some had been visiting the caravan in the weekend and started to ask for visit during the week. Because the use of the caravan is so resource intensive, there need to be at least 100 persons gathered for the caravan to make a visit.	U

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		Often there were half or even less. Now the people requesting a visit needs to guarantee that there will be at least 100 people present.	
	Ro-Alert system	Message Content and Format: Warning messages should be concise, clear, and compatible with different devices, providing accurate information about the emergency situation and supporting multilingual capabilities.	I
		Security and data protection: The alert systems needs to be protected against cybersecurity threats and should uphold the highest data protection standards. Only authorised operators (radio, mobile, TV) should be involved.	I
	Ro-Alert system	As a public warning system, the effectiveness depends on the quality of alerts generated by the public authorities that use the system. Sufficient human resources to generate alert messages and control the quality of the alerts is necessary.	U
		Timeliness and reliability of the warning messages are vital. The system should deliver alerts promptly and consistently to enable individuals and communities to take immediate action, fostering a proactive response to emergencies.	U
	HartslagNu (HeartbeatNow)	The system should be adapted and strengthened based on experience. The number of qualified persons in the country, the number and coverage of volunteers, their willingness to accept an alert, the number and coverage of AEDs, the response times are important data that should support effective planning.	U
	Everbridge Public Warning	As a public warning system, the Public Warning Center's effectiveness depends on the quality of alerts generated by the public authorities that use the system. Sufficient human resources to generate alert messages and control the quality of the alerts is necessary.	U
Organization's willingness to participate in an exercise	City Connect	The successful implementation of the app depends on the willingness of the organization to actively participate in the exercise. This includes the commitment to regularly update the app with relevant information, respond promptly to citizen queries, and address any technical glitches swiftly. If the organization does not fully commit to the process, the app's effectiveness and reputation may be compromised.	I

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	School training campaigns	The school training campaigns work with volunteers, if there are no prepared volunteers it's not possible to implement the solution. Further, there are schools that do not want to participate in the awareness campaigns.	I
	EU Modex	The exercise is very costly; therefore organisations need to allocate resources and time to participate in the simulation. Also, they need to accept the fact that they may need to make some changes in their governing rules in order to better collaborate with other emergency organisations.	I
Organisation's sense of responsibility	City Connect	The organization must possess a strong sense of responsibility towards its citizens. This is what drives the consistent and accurate delivery of information, the timely response to queries, and the openness to feedback and improvements. An organization that understands its responsibility to serve the public will be more invested in the success of the City Connect app.	I
	EU Modex	A sense of responsibility is highly important so the members of the organisation are open to dedicating resources and time to prepare for something that will happen in the future.	I
Response capacities of the organizations involved in the exercise	EU Modex	For the exercise to be effective, it is important to consider the response capacities of the organisations involved in the exercise. Response capacities cover not only the resources available at the organisations but also how to utilise them. Moreover, response capacities mean being prepared with plans to handle a crisis when it occurs and being ready to collaborate with others when needed.	U

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