



**engage**

Engage Society for  
Risk Awareness and Resilience

# **WHITE PAPER**

## **Pathways to Resilience: Results and insights from the ENGAGE project**



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# ENGAGE: White Paper

Pathways to Resilience: Results and insights from the ENGAGE project

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This publication is to be seen as a popular dissemination of already published findings by the ENGAGE consortium and is based on a selection of deliverables, blog posts, and other content that has been created for the purpose of enhancing the visibility of the project and its results.

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# Executive Summary

## Pathways to Resilience: Results and insights from the ENGAGE project

There are many pathways to enhancing the overall resilience of societies, and this document seeks to highlight a few that have been identified through the work of the ENGAGE project. The subsequent chapters can be seen as a map of sorts- with theoretical frameworks leading to the exploration of lesser-known methods and strategies of enhancing the collaborations of citizens and authorities, which are then bridged to technological innovations that lead to trails and paths yet uncharted. The document concludes with propositions for new directions that can be further developed and applied by researchers, practitioners, and policy makers and highlights the value of taking an interdisciplinary approach to research in order to guide readers in their future endeavours to enhance resilience. Enjoy the journey!

### About the ENGAGE Project

The actual global scenario is increasingly exposing the human society to higher hazards, requiring that all individuals specifically and the civil society at large, acquire the ability to rapidly respond to natural disaster and to man-made risks. Risk awareness is indeed a strong priority for modern societies and social resilience is necessary to enhance successful responses to unexpected emergencies.

In the actual strategies there is a gap between the formal effort of public authorities to protect citizens from harm and the voluntary support provided by citizens during emergencies.

Starting from this awareness ENGAGE addresses the whole society and tries to bridge the different ways of intervention to make communities more skilled in responding to disasters jointly and therefore more resilient.

We analyse past natural emergencies, terrorist attacks, and man-made disasters to understand how citizens supported formal intervention practices during emergencies under specific contextual conditions.

Together with real practitioners from our Knowledge and Innovation Community of Practice (KI-CoP), we propose emergency response strategies to bring the population closer to rescuers and authorities, bridging the gap between formal and informal guidelines in specific contexts.

We validate our solutions with real users ensuring that they can be transferable to different contexts and can produce actionable knowledge and validated risk management guidelines.

# About ENGAGE

## The ENGAGE Consortium

The project consortium is composed of 15 partners from 8 countries and includes representatives of first responders, civil society organizations, NGOs, citizens representatives and organizations with both practical and scientific knowledge regarding societal resilience.



## Knowledge and Innovation Community of Practice (KI-CoP)

One of the key components of the ENGAGE Project's methodology is the participatory collaboration with real emergency workers from the fields of safety and risk management.

The KI-CoP is an open association including practitioners, NGOs, Virtual Operations Support Teams, researchers scientists, and citizens' representatives supporting ENGAGE as users and co-owners of its solutions.

To learn more about our KI-CoP and its composition, [visit the dedicated page](#).

## Knowledge Platform

The Knowledge Platform is an interactive web platform dedicated to the topic of societal resilience. It hosts the Catalogue of Solutions, a repository of solutions to improve the interaction between emergency responders, authorities and civilians in emergency situations. It is one of the main outcomes of the EU-funded project ENGAGE. [Access the platform here](#).

# Chapter 1: Introduction

Authors: Alexandra Olson (EENA)

## 1.1 An overview of the ENGAGE project

In February of 2023, residents of Gaziantep, Türkiye, helped to pull their neighbours and loved ones from the rubble after a series of earthquakes that devastated the area. In August, the survivors of the wildfires in Maui, Hawaii, self-organized relief efforts to deliver food and other supplies to those who had been impacted. Contributions like these in the response and recovery phases of a disaster are a testament to the inherent sources of resilience that citizens constitute and remind us of the importance of collective action. However, these actions are often overlooked both within the field of research and within formal disaster management strategies and planning, which tend to focus on the efforts of first responders and public authorities to protect citizens from harm (Pokjansek et. Al, 2017).

To address this gap, ENGAGE seeks to take a “whole of society” approach to improving societal resilience by identifying and gaining a better understanding of the ways that citizens, local communities, and NGOs compose resources in all phases of the disaster cycle. In order to accomplish this goal, ENGAGE aims to find ways that these resources can be tapped into, so that they can be linked with the planned, formal approaches to preventing and managing disasters. In this regard, ENGAGE pays particular attention to the variation of the strategies, practices, and methods adopted by citizens, communities, and local authorities within the different contexts in which they were developed. The ultimate objective of this work is to equip European policymakers, authorities, and first responders with new knowledge and solutions that can be modified and adapted to fit their needs in order to bridge the gap between formal approaches to increase resilience and the inherent resilience that can be found within societies.

This white paper is structured to comprehensively outline the research and findings that have been carried out to achieve this objective, and to subsequently illustrate how each sub-theme contributes independently and collectively to enhancing societal resilience. This publication is intended to reach audiences such as policymakers at national and local levels, academia, first responders, citizens, non-profit organizations (NGOs), and other public authorities. The reasoning behind the broadly chosen target audience is simple. If the aim to better equip societies to understand the risks related to and be prepared to respond and adapt to, nature-derived and man-made adversities is to be achieved, collaboration within and between stakeholder groups is essential. Therefore, this publication seeks to demonstrate how individual actions, whether they be providing donations to individuals impacted by a disaster, improving mechanisms and strategies within an organization for involving volunteers in disaster response or recovery, developing new technologies to facilitate information flow in a crisis, or implementing a policy that improves crisis communication, collectively contributes to enhancing the overall resilience of a society.

## 1.2 Glossary

| Term                | Explanation                                                                                    |
|---------------------|------------------------------------------------------------------------------------------------|
| Societal resilience | The potential for all types of social actors, formal and informal, to effectively cope with an |

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                     | adverse situation and the social context influencing this potential. <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                      |
| Practitioners                                       | “Someone who is qualified or registered to practice a particular occupation, profession in the field of security or civil protection” <sup>2</sup>                                                                                                                                                                                                                                                                                     |
| Disaster life cycle                                 | Includes prevention and preparedness to response, recovery and learning; anticipation and assessment, preparation, and review <sup>3</sup>                                                                                                                                                                                                                                                                                             |
| Knowledge Innovation Community of Practice (Ki-CoP) | Community of Practice involving practitioners (e.g first responders, authorities, members of civil society organizations) and citizens supporting the project activity with the role of users and co-owners of its solutions.                                                                                                                                                                                                          |
| Solutions                                           | A term used to indicate the approaches, guidelines, models, methods, practices, processes, strategies, recommendations, and tools, that contribute to societal resilience building throughout the whole disaster life cycle, developed and used by the different practitioners and citizens.                                                                                                                                           |
| Social media                                        | Tools that facilitate open and online exchange of information through conversation, interaction, and exchange of user-generated content, which allows people, communities, practitioners, and authorities to establish connections and links with others who are similar to them, or whom they find relevant.                                                                                                                          |
| Co-creation                                         | Involving citizens, users, academia, public authorities, businesses (including SMEs), in processes that span from identifying problems to delivering solutions.                                                                                                                                                                                                                                                                        |
| Contextual aspects                                  | This refers to aspects that enable individuals, social groups, or society as a whole to act before, during, or after a crisis. They go beyond an individual’s experience during a crisis since they relate back to the structure of society. The way a city is built, the density of civil society organizations in a society or economic and social inequality can all become relevant in specific ways during a crisis. <sup>4</sup> |
| Emergency organizations                             | These organizations and their members all rely on specific procedures and tools to do their job. They are formalized crisis actors. This puts them sometimes at odds with informal actions of citizens who respond to disaster. For this                                                                                                                                                                                               |

<sup>1</sup> Definition from D1.4: The model for assessing and enhancing societal resilience.

<sup>2</sup> <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/support/faq;keywords=/3156>

<sup>3</sup> CEN/TS 17091:2018. Crisis management. Guidance for developing a strategic capability.

<sup>4</sup> This definition can be found on the ENGAGE Knowledge Platform: <https://www.project-engage.eu/glossary/>



|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | <p>reason, ENGAGE proposes a series of solutions that help emergency organizations to improve their interactions with citizens for improving societal resilience.<sup>4</sup></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <p>Authorities</p> | <p>A set of institutions and organizations having legitimate political and administrative power are normally responsible for disasters and crisis preparedness and management. Highly formalized, they base their actions on disaster planning and a set of specialized professionals and experts to do so. This lets them sometimes perceive spontaneous, informal coping of citizens disaster as a nuisance. For this reason, ENGAGE proposes a series of solutions that helps authorities to recognize and use the potential of citizen action during a disaster by proposing a Catalogue of Solutions to improve their interactions with society.<sup>4</sup></p> |
| <p>End-user</p>    | <p>The solutions that we analyze and catalogue in ENGAGE’s Catalogue of Solutions address specific organizations and individuals. Though transferability is a criteria for integrating solutions in our catalogue, ENGAGE highlights that solutions are always dependent on a specific context to be able to function properly. This entails having the potential end-user in mind when we analyze the potential of solutions to enhance societal resilience.<sup>4</sup></p>                                                                                                                                                                                         |
| <p>Citizens</p>    | <p>ENGAGE’s tries to tap into society’s potential for overcoming disasters and crisis. This means addressing specific social groups, but also each citizen, understood as a recognized member of a given society, and improving her or his interactions with emergency organizations and authorities. Also, focusing on the individual citizen enables ENGAGE to integrate solutions in its Catalogue of Solutions that directly improves communication, but also the transfer of knowledge via an individualized interface.<sup>4</sup></p>                                                                                                                          |
| <p>Trust</p>       | <p>The expectations that others will assist us when a disaster strikes and the fact that those who surround us are a source of security rather than a menace refers to the importance of trust in crisis. Trust can be interpersonal or collective, but it is always a necessary condition for cooperation. It plays notably an important role for structuring interactions between citizens and emergency organizations and authorities.<sup>4</sup></p>                                                                                                                                                                                                             |

### 1.3 Overview of white paper structure

**Chapter 1** introduces the project, its aims, and the work that has been conducted to reach these aims. A glossary of terms often used within the project can also be found within this chapter.

**Chapter 2** delves deeper into the topic of societal resilience as well as the perspective of ENGAGE. It also provides an overview of our case studies- which were key for the theoretical and conceptual development of the project- and presents our model for assessing and enhancing societal resilience.

**Chapter 3** provides an overview of formal and informal solutions as ENGAGE has defined them, in what contexts they emerge, and the actors who are involved in developing and employing these solutions.

**Chapter 4** introduces the ENGAGE Knowledge Platform and the Catalogue of Solutions, which is hosted on the Knowledge Platform, and is composed of tools, technologies, and guidelines that have been implemented in different contexts in order to enhance collaborations between citizens, public authorities, and first responders. This chapter also includes examples of solutions that ENGAGE partners have introduced to the project and, in some cases, developed further throughout the project's lifetime. **Chapter 5** and **Chapter 6** provide an overview of technologies that can ensure efficient information exchange from public authorities to citizens during a crisis, which include a blueprint and prototype of an AI-enabled chatbot.

**Chapter 7** introduces the policy work of ENGAGE, which encompasses the themes of communicating with citizens and the involvement of spontaneous volunteers in disaster management. This chapter will illustrate how the cumulative work of the project has contributed to the development of recommendations around these themes, and will conclude with implications on operational, policy, and research levels.

Finally, **Chapter 8** concludes the white paper by highlighting the importance of taking an interdisciplinary approach to enhancing societal resilience, the value of which was not only illustrated in the previous chapters but exhibited in practice through collaborations with our advisory board, the Knowledge and Innovation Community of Practice (Ki-CoP), for the duration of the project's lifetime.

# Chapter 2: Framework for Modelling and Assessing Societal Resilience

Authors: Jan Woerlein (ENS), Stian Antonsen, Jannicke Fiskvik (NTNU-SR)

## 2.1 Introduction

The ENGAGE project developed a theoretical framework for understanding the conditions of “societal resilience” - a concept we ultimately defined as the potential for all types of social actors, formal and informal, to effectively cope with an adverse situation and the social context influencing this potential. This was an ambitious task and entailed both the review of existing theoretical perspectives as well as in-depth case studies, which served to empirically ground our own theoretical and conceptual development.

Societal resilience is closely linked with social context since the social conditions of society is likely to play a significant role in its ability to cope with adverse situations. Social context here refers to the cultural, economic, political, and social factors that shape the way a society functions and interacts with the world around it. In addition, we deemed it likely that the situational context of disasters plays a significant role in influencing the way formal and informal actors can contribute to reducing consequences.

## 2.2 Case study methodology- Small N and large conclusions?

For obvious reasons, it is impossible to empirically study the way society influences the way a disaster is dealt with. Hence, there is a need to find the situations where the phenomena we want to shed light on, are the most visible. Perhaps unsurprisingly, the major disasters and disturbances to society are among the situations where such empirical opportunities arise. This is why the case study approach is key to the ENGAGE’s theoretical and conceptual development.

But how is this even possible? How can we go from studying particular, “small” cases to theorizing around the “big” picture of societal resilience? Luckily, we are not the first social scientists pondering this question. There is a long history of case study research (e.g Ragin 1992), and case studies are central in the theoretical canon of safety and resilience research (Antonsen & Haavik, 2021). A common thread in this line of research, is that it is a fundamental misunderstanding that “small N studies” cannot be the basis of generalization, although obviously not in the statistical sense (Flyvbjerg, 2001). The generalization is done in the form of concept and model development grounded in empirical data from studies of cases that are strategically selected to represent the phenomenon under study. A case study is defined as

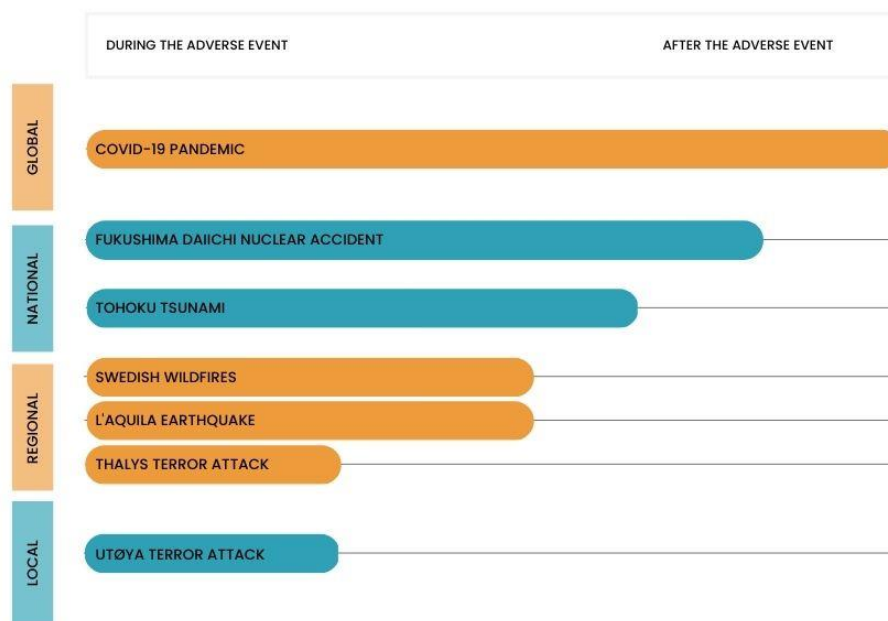
an empirical inquiry that investigates a contemporary phenomenon (the “case”) in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident (Yin, 2014, p.16).

For ENGAGE, where it was part of the project DNA to be sensitive to differences in context, we took special interest in Yin’s emphasis on the links between the phenomenon and the context within which it is situated, and that the two are not always easily distinguishable. When studying a series of disasters, we did not see the massive difference in context as a methodical challenge, but rather an empirical opportunity to achieve variation on important variables – and the most important variable was context.

### 2.3 ENGAGE’s case study approach

The case studies and their theoretical implications are described in the [projects’ Deliverable D1.4, Model for assessing and enhancing societal resilience](#). Our analysis started out with analyzing data from two extreme events that are somewhat similar and for which there exist rich data - the Thalys train attack and the terror attack on Utøya. We will discuss the latter case later in the subsequent section.

These cases are extreme in the sense that they involved ordinary people taking risks on their own behalf which contributed to preventing or reducing harm to others. Following a sequential strategy inspired by grounded theory (Glaser & Strauss, 1967), we use these cases to develop and refine the project’s theoretical and analytical model. To be able to “test” the relevance and limits of generalization of this model, we applied the model to cases that differed from the Thalys and Utøya cases. The cases differed in the sources of the crisis, their onset and duration, as well as the crises’ scale. Being “test” cases, these studies were related more directly to the model, and were not described in the same empirical detail as the Thalys and Utøya cases.



Case comparison - time and scale

Figure -

The rationale was using five other cases to assess if the model's dimensions were applicable or not, by confronting it with settings different than the two base cases.

## 2.4 The case studies

### 2.4.1 Terror attack at Utøya, Norway

One of the cases that ENGAGE chose for analysis was the terror attack in Norway on July 22nd, 2011, where a solo terrorist set off a car bomb outside the Government Complex followed by a mass shooting on the island of Utøya, where the youth organization of the National Labour Party held their annual summer camp.

The emergency response of the police to the Utøya attack was hampered by lack of local knowledge, information and communication problems in addition to corresponding coordination difficulties. This led to a conclusion in the public investigation on the disaster, that the official emergency response actions were the story of “the resources that did not find each other”. Paradoxically, while the police struggled with coordination and decision-making, and ambulances were left waiting, civilians had already established a spontaneous rescue operation. Their actions covered a long chain of coping actions which varied from evacuating fleeing victims by boat; providing care, clothes, and first aid on the shoreside; and providing transportation to the spontaneously organized evacuation centre at a nearby conference hotel. The value of this engagement receives praise in the public investigation report, and there is no doubt that the contributions of spontaneous volunteers helped to save many lives.

While the public commission mentions such contributions, it does not go into detail on what made them possible. By means of in-depth interviews with the ordinary people involved in helping the victims, we see a very different picture than the one painted in the public investigation. Where most formal emergency response actors had little or no knowledge about local conditions and resources, the spontaneous volunteers had the benefit of local knowledge and social capital which were crucial for the immediate assistance of victims. First of all, they were already there, as the actors were inhabitants, camping guests or cabin-owners in immediate vicinity of the Tyrifjorden lake. Second, they had resources immediately at hand to aid their actions - boats, gasoline, blankets, towels, houses, cabins, and cars. Third, they had the benefit of social networks that could be activated to refill these resources by calling neighbours, family, and friends, which we found was crucial in dealing with the duration and magnitude of the event.

After the immediate rescue of victims fleeing from Utøya island and providing them with care on the shoreside, there was still a challenge of what to do next. The high number of victims meant that there was a need to assemble the victims in a safe place where they could be taken care of by trained personnel and registered by the authorities. Victims were therefore transported to the nearby conference hotel at Sundvolden. Despite the fact that the municipality had no agreement with the hotel to provide emergency services, both the spontaneous volunteers and the municipality's crisis personnel gravitated towards Sundvolden without, as we understand, knowledge of each other's actions during the crisis. The municipality's team arrived at Sundvolden only minutes before the first victim arrived. Simultaneously, the hotel management had, on their side, started mobilizing personnel resources to the hotel on a hunch that they could be involved. Although there are not many alternatives other than Sundvolden with the capacity to deal with the number of

victims, it is striking how different actors in a chaotic situation oriented their actions toward the same goal without knowledge of each other's decisions.

This is a story of the willingness to engage in an extreme situation, the use of social capital to provide material resources and the crucial role of local knowledge as a means for both efficiency and coordination. Thus, our study provides grounds for a very different narrative than the public inquiry's description of the formal resources that did not find each other. A preliminary finding in our study is a narrative of informal resources **actually** finding each other.

# Chapter 3: Formal and Informal Actors

Authors: Sahar Elkady, Leire Labaka (TECNUN)

## 3.1 Introduction

Disasters are becoming more frequent and complex to deal with. The interconnectedness of the social, economic, and physical (i.e., systems of critical infrastructure) facilitates the propagation of events which aggravate the damage and interrupt many critical services. To deal with these situations, communities need to be prepared and resilient in order to handle the adversities and properly respond and adapt to upcoming challenges and situations. Two groups of actors get involved when dealing with these complex disaster scenarios: the formal ones- which include governmental organizations, emergency services, emergency-related authorities, critical infrastructures managers, and nongovernmental organizations such as NGOs (for example the Red Cross)- and the informal ones- which include ad hoc response groups that appear as a result of the emergency itself such as non-organized volunteers and citizens. Although the roles and responsibilities of each actor differ, the participation of all the stakeholders is necessary and wanted in order to better cope with disasters.

Therefore, as a starting point, it is important to ask different stakeholders what they expect from other stakeholders. In the ENGAGE project, we conducted an exploratory analysis through a survey and semi-structured interviews to gather the needs and expectations of emergency services and authorities from the citizens when dealing with disasters. Specifically, we asked members of the emergency services and authorities what they expected from civil society in order to better deal with disasters.

## 3.2 The needs and expectations of formal actors in disaster management

From the first study, we concluded that emergency services and authorities have the following needs and expectations from society to better deal with emergencies. The first priority for emergency organizations and authorities is that citizens follow their recommendations in times of crisis to avoid anyone being injured and to facilitate the proper allocation of resources while emergency response actions are being carried out. In relation to this, taking into account the effort that organizing spontaneous volunteers requires, they request citizens to self-organize themselves through existing organized volunteering groups. Before the crisis, emergency organizations ask people to be self-prepared in terms of acquiring survival resources, and that they participate in training exercises to be aware of the potential risks and mentally prepared and ready for a crisis situation to occur. During the crisis, emergency organizations need to be informed about what is happening, and citizens can help by providing information (e.g. videos, photos etc.) about the situation of the affected people and their specific needs using the official communication channels. Finally, after the crisis, society plays a crucial role in recovering back to normal life. Showing solidarity with the most affected and vulnerable citizens, creating community networks to help people, and participating in debriefing meetings to identify lessons learned for future crises is important in order to be better prepared.

Understanding the needs and perceptions of emergency services and authorities to better deal with crises is essential to promote and facilitate the involvement of all the stakeholders in the management of disasters. Furthermore, defining the roles and responsibilities of each actor is of utmost importance

to facilitate the collaboration and cooperation of all the actors involved.

### 3.3 Informality as a sign of resilience: the development of informal solutions

Disaster management has been structured into a very hierarchical and centralized structure based on a command-and-control system. These formal structures are composed of formal disaster response agencies such as governmental-level emergency management department and services, first responders, and organized NGOs. These agents are coordinated through previously established formal procedures and rules and use previously established and validated solutions, methods, plans and tools to deal with the situation. In this project we call these solutions, methods, plans, and tools formal solutions. In this case, the involvement of informal actors such as spontaneous volunteers and civil society is hardly taken into account; and to be considered volunteers need to be part of volunteering organizations to be of use for emergency responders.

However, sometimes, disasters evolve in unpredictable ways and in these situations, the already established formal procedures might not be suitable to handle the disaster as they do not allow for flexibility and adaptability of the procedures and roles. Therefore, new methods, plans and tools need to be adopted and improvised without having the certainty of their effectiveness to deal with the situation. We call them informal solutions. Moreover, informal actors, such as citizens and non-organized volunteers, often start participating and even innovatively take the lead in responding to the needs of society. This informality is a sign of the resilience level of the community and provides the means when improvisation and adaption to new scenarios is needed.

This research defines some criteria to characterize and differentiate between formal and informal solutions:

**Uncertainty:** the more uncertain the situation is, the more informal the solution tends to be. It is impossible to predict for all situations, and therefore, the formal solutions might not cover all the possible situations. In these situations, informal solutions are adopted and play a significant role in managing the situation.

**Legislation:** the law provides support for actions that are defined in formal procedures and plans. When something goes wrong, if formal procedures were followed, the responders will be legally covered. However, in the case of adopting informal solutions, the legal coverage of the responders is not guaranteed in case something goes wrong. Therefore, formal responders hardly adopt these informal solutions because of legal liability.

**Bureaucratic delay:** For a solution to be considered formal it needs to be tested and properly documented, which takes time. On the other hand, informal solutions do not have to be approved and, in many cases, they are created and implemented at the same time because the situation requires it. If, after being used and proven to be successful, they want to be included formally in the formal response plan, then it would require some time.

**Stakeholders:** Normally, formal stakeholders are the ones implementing the formal solutions as they are officially responsible for dealing with crises and implementing formal procedures. However, informal stakeholders, such as citizens or volunteers, might also implement formal solutions in some cases with previously established contracts, for example in Norway, the government made contracts with some individuals to shovel the snow that is blocking the roads in their towns, or because of the lack of resources at some point of time. On the contrary, informal actors are often the ones creating



and adopting informal solutions. However, if the situation is unpredictable, formal actors can also create and adopt informal solutions to respond to the situation.

### 3.4 Informal or formal? Outlining the formalization process

Differentiating between what is formal and what is informal is very important considering that liability could fall on emergency personnel when applying informal procedures. However, in practice, the solutions are not totally formal or totally informal, but are rather along a continuum line between formal and informal. Not only do small variations from the already established procedures often occur when implementing solutions, but it is sometimes difficult to characterize if a volunteer in an NGO is formal or informal since they do not have the same responsibility as the emergency services but may follow some of the same rules and face some form of liability when dealing with crises.

When informal solutions demonstrate their effectiveness and usefulness to deal with crisis situations, they are sometimes included as part of the formal procedures to respond to crisis. However, this does not always happen. There are some informal solutions that, even if they are always applied in disaster management activities and have proven their usefulness to deal with critical situations, they are not formalized and continue being implemented by informal actors. Furthermore, it might happen that when an informal solution becomes formalized and managed by formal actors, it loses its effectiveness and success since citizens might feel it is no longer relevant to them. In order to represent the path for formalization process of informal solutions, we developed a framework that describes the enablers and the barriers that drive or slow down the formalization process. Figure 1 describes the formalization process and defines the drivers, the enablers, and the barriers of the process.

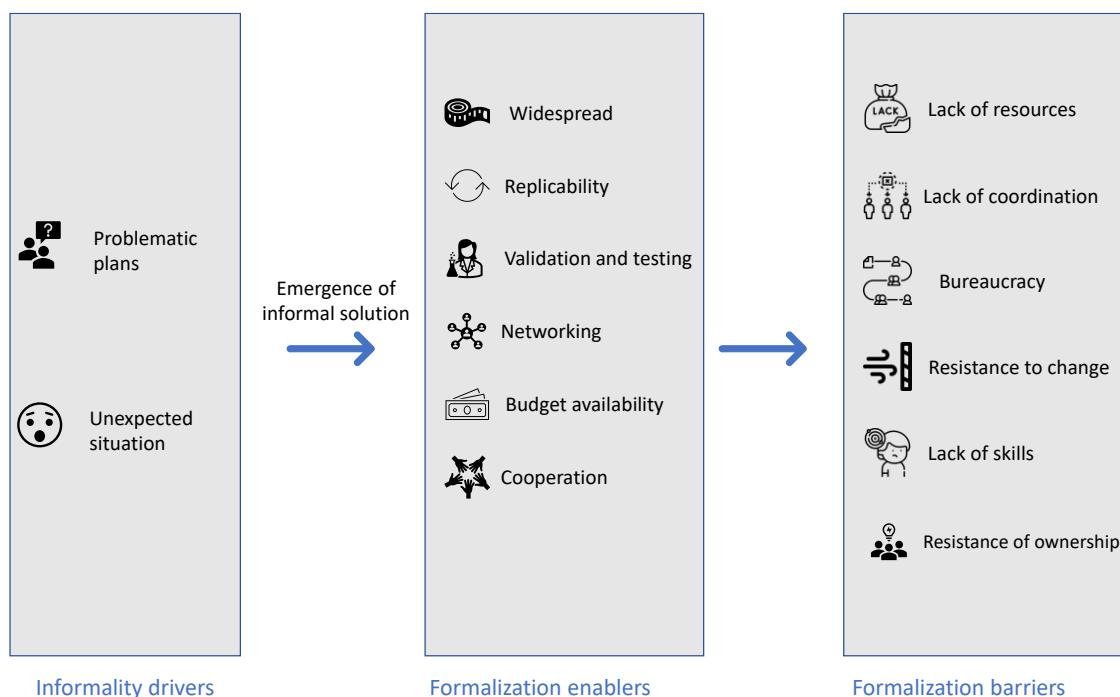


Figure 1: Formalization process of informal solutions

Informal solutions are adopted in two situations: when there are problems with the previously established plans or when the situation is uncertain. Within the problematic plans category, we include bad planning and preparedness, where there is a lack of plans and training to deal with situation; the

lack of resources or unexpected outcomes of the plans; and when the plan does not match the given situation. In case of uncertain situations, we include overwhelming situations, unprecedented situations, and situations where there is a lack of resources because they were unpredictable.

Once the informal solutions are adopted, there are some enablers that facilitate the formalization of the informal solutions. These enablers are whether or not the solution has been tested and validated; the solutions have been used repetitively; that the use of the solution has been spread throughout the community; if there is available budget to implement the solution; and if there are proper networks and cooperation efforts to and from different stakeholders to properly implement it.

However, there are also several barriers that hinder the formalization process of informal solutions, which include: a lack of proper skills; a lack of human, financial or equipment resources; bureaucratic difficulties for formalization; difficulties to coordinate among different stakeholders; resistance to change and a lack of ownership for acquiring the solution.

This framework helps emergency responders and authorities to better understand the process of how improvised and ad hoc implemented informal solutions can become formalized, and which are the enablers and barriers in this process. Being able to come up with and implement informal solutions is a clear sign of the resilience capacity of the system to cope with unpredictable situations.

# Chapter 4: Solutions to Enhance Interactions Between Formal and Informal Actors

Authors: Jacqueline Floch (SINTEF)

## 4.1 Introduction

The ENGAGE catalogue of solutions is a knowledge repository that provides an overview of solutions that strengthen societal resilience. These solutions illustrate approaches or instruments that facilitate collaborations between communities and citizens and the formal actors involved in the preparedness, prevention, response, and recovery of/from disasters. The main target audience is first responders and public authorities, otherwise referred to as “formal” actors. The catalogue provides them with support in investigating solutions to reach communities and citizens and collaborate with them. The catalogue is intended to be used between crises, between the recovery phase after a crisis and the preparation for the next crisis, as learning from existing solutions can aid organizations and regions to improve their work. Beyond formal actors, a secondary audience are researchers who seek to understand current practices and identify potential gaps.

## 4.2 A Variety of Solutions

The catalogue covers a broad range of over 100 solutions which can be applied during different phases of the disaster cycle. They include awareness campaigns, media, guidelines and incentives, ambassadors and communities of practice, alert systems and call centers, as well as means of providing psychological support. In line with the overall aim of improving societal resilience, solutions are classified according to the type of capacity they contribute to strengthening. We consider five kinds of capacity: communicating with or alerting citizens; improving preparedness levels among citizens; improving autonomy, coping abilities, and proactiveness of citizens; improving involvement of and cooperation with citizens; and organizing and coordinating volunteers. This information is expected to be especially relevant to first responders and public authorities who wish to facilitate a particular kind of interaction with communities and citizens. In addition, for each solution, the catalogue describes which type of organization is responsible for providing the solution or the service to the target population and the type of target population. For instance, a solution may be provided by authorities or by NGOs to citizens at risk or to spontaneous volunteers.

The solutions were identified through a systematic mapping of scientific publications, case studies and project reports as well as through surveys, interviews and workshops involving emergency experts. In addition, ENGAGE partners and KI-CoP members have provided additional information.

Exploiting the results of this systematic mapping, we were able to understand trends and perform a gap analysis, i.e., to identify the needs and purposes not covered so far. We find that most solutions deal with enhancing citizens’ preparedness and improving communication. On the other hand, few solutions deal with empowering citizens in the decision-making process and facilitating a quick recovery.

### 4.2.1 Examples of solutions

In some cases, members of the consortium have developed and/or had experience with utilizing specific solutions, which were then brought to the attention of ENGAGE to be included in the Catalogue of Solutions. Other partners utilized solutions that had been identified by ENGAGE in their day-to-day operations, modifying them to suit their specific purposes. Four examples are provided in the subsequent sections.

#### 4.2.1.1 The Preparedness Guard (Marita Hoel Fossen- The Trondheim Red Cross)

The Trondheim Red Cross, a partner in ENGAGE, has implemented the Preparedness Guard solution in their day-to-day activities. The Preparedness Guard system is a method and process for a non-governmental organization (such as the Red Cross) to organise volunteer efforts in local communities during emergency situations. The main aim of the Preparedness Guard is to facilitate local resource allocation during emergencies by having several volunteers that are easily reachable and prepared to contribute. The system has also served as a means of recruiting volunteers for the Red Cross. It is a low-threshold opportunity for citizens to participate in volunteer work, as the people that sign up for the Preparedness Guard will only be contacted in case of emergencies and have one day basic training a year. Citizens are informed and mobilized when required during emergency situations to carry out specific tasks such as, for example, providing transport, manning information posts in an evacuation area, traffic control, and administrative work like registering individuals.

Preparedness Guards have been used to strengthen the community as a support to the official emergency departments after floodings, in evacuations, for psychosocial support etc. In short, not only can Preparedness Guards contribute to enhancing preparedness possibilities in their local region, but they can also empower governance and leadership of volunteers in emergency situations.

#### 4.2.1.2 Resource & Volunteer Management App (RVM) (George Manea- Romanian Department for Emergency Situations)

The Romanian Department for Emergency Situations (DSU) recognizes that civil society often comprises the first line of awareness dissemination as they represent the main drivers of change in local communities. They are also a valuable partner during the prevention, preparedness, response, and recovery phases of a disaster or emergency, which highlights the importance of taking an all-of-society approach to disaster management. Taking such an approach is particularly important when seeking to address the seven baseline requirements of resilience: assured continuity of government and critical government services, resilient energy supplies, the ability to deal effectively with uncontrolled movement of people, resilient food and water resources, the ability to deal with mass casualties, and resilient communication and transportation systems. This is why DSU has built an ecosystem of NGOs (for specific emergency situations and in line with the baseline requirements of resilience) and developed a wide range of solutions that can contribute to enhancing societal resilience (i.e.: RVM App, Be Ready Caravan, Be Ready Portal, DSU App, etc.). These solutions have been included in the ENGAGE catalogue of solutions and have been tested during the validation process of the project exercises.

DSU has developed the Resource & Volunteer Management (RVM) App, which is a tool for managing volunteers as well as the resources that civil society provides to DSU in case of major seismic alert state or other natural disasters. The application allows inventory management of available resources, maintains a clear situation regarding the quantities, types of materials, and places where they are stored, as well as the status of volunteers organized on distinct specializations. The mobile component of the solution can be used by all rescue forces in the field to validate professional volunteers, manage the spontaneous ones, and send alerts for help in various areas.

Any resource and any volunteer who can help in the event of a major calamity increases the chance of survival chance for a victim. Given the estimates of damage and loss of life in the event of an earthquake, civil society must be able to effectively intervene in its turn to provide support and help without endangering or hindering rescue efforts by the authorities. Almost all CSOs (Civil Society Organizations) have a set of resources, whether they are headquarters, tents, sleeping bags, high-coverage communication channels, shelter facilities, first aid kits, etc. These resources are only known to them, and recently, the Department of Emergency Situations has concluded developing collaboration protocols with them in order to map their existence.

The RVM app allows individuals who have undergone special training or have professional experience to register prior to a disaster, which will allow them to offer their help (for example, to administer first aid or declutter risky areas around fallen buildings) if such an event occurs. This aspect is particularly important since, in the aftermath of an earthquake or another emergency, volunteers who belong to CSOs may be scattered all over the country and may not have any form of identification with them. Such a registration process also allows them to be traced and deployed in areas where they are the most needed by rescue officers.

#### 4.2.1.3 LazioAdvice (Maya Battisti- Cittadinanzattiva & Francesca De' Donato- ASL ROMA 1)

The Department of Epidemiology ASL ROMA 1 (ASL) is a partner in the ENGAGE project. A heat wave exercise, which sought to validate a few of the solutions featured in the Catalogue of Solutions, was carried out together with Cittadinanzattiva (CA) in Rome, Italy. The aim of this activity was to enhance societal resilience through information campaigns to the local population on the health risks associated to extreme weather events, like heatwaves, and provide recommendations and simple advice to adopt during heatwaves. Furthermore, the activity built upon and supported actions put in place by ASL ROMA 1, the local health authority.

The Lazio regional heat plan and ASL ROMA 1 provides active surveillance of the vulnerable elderly at-risk during heat waves via General Practitioners (GPs) and dedicated health personnel with phone calls and home visits to check the health status of patients via the LAZIO ADVICE APP (Barbara et al. 2023), a digital platform used for health surveillance in the Lazio region. Patients/citizens who use the app can consult levels of heat severity (Level 1-Level 3), and access phone numbers for medical help and social services for specific cities. They can also learn about heat related health risks and download brochures/information leaflets that describe how to act and protect themselves during a heat wave.

During the summer of 2023, an informative brochure was developed and personnel from ASL and CA co-organized a training event for volunteers and health staff and carried out an information campaign within a district of Rome to help promote the active surveillance and community

awareness. Information materials were also disseminated through the social media accounts of CA, DEPLAZIO and ASL ROMA 1 during the summer. Volunteers from CA distributed the brochure in the local community and medical personnel from ASL promoted the activity in medical centers, services, and GPs to enhance adherence to the program of elderly patients most at risk and promote awareness and prevention to climate related risks within the community. The timeliness of this activity was key as summer 2023 was extremely hot in Italy, stressing the importance of such actions that support the collaboration of institutions, responders, and volunteers to support communities and promote activities put in place for safeguarding health of citizens and preventing risks.

The implementation of the heat wave information campaign was supported by Cittadinanzattiva, who implemented a civic action plan with the aim of strengthening and amplifying the institutional awareness campaign, and thus adherence to the active surveillance conducted through the LazioAdvice app.

#### 4.2.1.4 The Enabling Social Action Programme (Maya Battisti- Cittadinanzattiva & Francesca De’Donato- ASL ROMA 1)

During the planning phase of the heat wave validation exercise, the need to improve the familiarity of citizens with the tools and activities outlined in the Lazio regional heat plan as well as enhance awareness of the health risks associated with heat waves in general emerged as key issues. These aspects were particularly important for CA and ASL ROMA 1 to bear in mind, as the adoption of prevention measures in previous years among the population have been limited which, it was noted, may in part have been due to the limited impact of communication campaigns that took a “top-down” approach. Therefore, in order to enhance awareness and engagement with the local community, it was decided to experiment with social action by exploiting the resources in terms of network and volunteers of Cittadinanzattiva. This allowed for a more bottom-up approach to disseminate information to be taken in order to improve awareness and response, which favored trust and the exchange of information at an egalitarian level within the community.

After conducting an analysis of the solutions featured in the Catalogue of Solutions, the “Enabling Social Action Programme” was identified as being able to suit the intervention needs of both CA and ASL ROMA 1 as well as the application context in terms of implementing actors and the resources available. Developed in the UK, The Enabling Social Action Programme aims to provide guidelines and recommendations for the public sector to support and promote social actions, which refers to people investing their time and other resources to help the community and contribute to the common good. In a nutshell, it aims to capitalize on social networks and relationships, empower governance and leadership, and facilitates resource allocation. Using the initial guidelines of the solution, the action of reinforcing the awareness campaign was structured. The name was modified to “Proximity Information Action” in order to better suit the context in which it would be implemented in Italy and emphasize the difference between “traditional” communication actions.

The implementation of the Proximity Information Action programme resulted in several positive effects. First and foremost, it enabled the extension of a multi-level stakeholder network, which will be able to work together on heat wave prevention in the coming years. Although the creation of stakeholder networks is also envisaged in the Lazio Region’s Heat Plan, so far these networks have been focused on health care services and emergency responders (health and civil protection) and less on social services and community-level stakeholders. Secondly, it facilitated the capacity building of volunteers and health personnel on an innovative and integrated approach to health

communication. Last but not least, it allowed for the optimization of resources for the public body implementing the Heat Plan, which benefited from a more effective awareness action (even if only on a limited portion of its territory on an experimental basis) without increasing costs thanks to the support of non-profit organizations and their volunteers.

#### 4.2.1.5 School training campaigns (Iñaki Gangoi- Ertzaintza)

Ertzaintza, the autonomous police force for the Basque Country and an ENGAGE partner, established awareness campaigns to be carried out in schools. These campaigns, which were a direct result of an agreement signed between the Basque Security Department and the Education Department in 2013, seek to promote values such as responsibility, privacy, empathy, and dignity, and to educate students aged 5 to 17 on risks such as cybersecurity or cyberbullying. So far, Ertzaintza has carried out over 1,000 talks in uniform, which exposes them to at-risk segments of the population in a friendly context, which therefore serves to enhance trust between the public and uniformed personnel. In addition, the implementation of these awareness campaigns helps to facilitate information-sharing between the public and authorities, which not only helps to enhance risk awareness but highlights the importance of investing effort in strategies that promote positive coexistence and preventative measures rather than punitive responses.

The program is tailored with language and content suitable for each age group and incorporates an online hazard assessment. One particularly important aspect in regard to the delivery of these campaigns is understanding the impact of the education and information being conveyed, as these programs undergo continuous analysis to achieve maximum efficiency and reach. This is why, in the past academic year, a survey was prepared with TECNUN and conducted with the students before and after the talks were given.

# Chapter 5: The Blueprint to Resilience: The Development of an AI-Enabled Chatbot

Authors: Nathan Stolerio & Bruria Adini (Tel Aviv University)

## 5.1 Introduction

Emergencies and disasters pose complex challenges to societal resilience. Traditional communication methods are often insufficient to handle the volume and speed of information needed during crises. AI-enabled chatbots, as innovative solutions, have the potential to provide a contextual, online, and zero-delay response and have the ability to offer solutions for neutralising false information.

Despite these promising capabilities, however, AI-enabled chatbot face several limitations, including the absence of a fully functioning model, a considerable gap between the current readiness of authorities and state-of-the-art AI technologies, and the lack of public feedback. Nevertheless, their strengths outweigh these limitations, as they offer cutting-edge solutions for societal resilience, adaptable to the preparedness level of different organizations.

## 5.2 The solution: An AI-enabled chatbot for emergencies and disasters

A key contribution of the ENGAGE project, led by Tel Aviv University, is the development of a comprehensive blueprint for AI-enabled chatbots designed to enhance societal resilience during emergencies and disasters. This blueprint outlines a roadmap for the creation and deployment of these chatbots and addresses the identified limitations and challenges.

The blueprint presents an innovative architectural design tailored to the unique demands of disaster management. It conceptualizes an AI chatbot system that is flexible, robust, scalable, and capable of being integrated within existing emergency systems. The architecture comprises several components: data processing, natural language understanding and processing, a dialog management system, a generation module, and an interface layer, as detailed below:

1. **Data Processing:** This component is responsible for cleaning and organizing incoming data, both from users and external sources, in a way that can be easily utilized by the chatbot system.
2. **Natural Language Understanding and processing:** This module translates user inputs into machine-readable intents, making it possible for the AI to interpret and respond to user queries.
3. **Dialog Management System:** It oversees the conversation flow and ensures that responses are relevant, coherent, and contextual.
4. **Generation Module:** It crafts responses to user queries based on the analyzed intent and context of the conversation.



5. Interface Layer: The interface is the point of contact between the users and the chatbot, designed for accessibility and ease of use.

Recognizing the challenges of trust, rapidity, and effectiveness in disaster communication, the blueprint includes a detailed approach to address these issues. It emphasizes the chatbot's role as an official and trusted source of information. It outlines mechanisms to provide quick, real-time responses to user queries and to direct users to relevant, accurate, and detailed information. The chatbot's design is centred around effective communication, providing actionable advice, and offering personalized guidance based on user inputs and profiles.

The blueprint for an AI-enabled chatbot is a novel and significant contribution to the field of disaster management. By leveraging cutting-edge AI technologies, it pioneers a new mode of communication between authorities and the public during emergencies. This innovation holds great promise for improving public awareness, response, and resilience during crises.

By providing a clear blueprint for the creation of AI-enabled chatbots for disaster management, the ENGAGE project contributes to both the theoretical and practical advancement of this emerging field. The innovative design of this blueprint not only addresses current limitations and barriers but also paves the way for future innovations in the use of AI technologies for societal resilience.

### 5.3 The Role of Open AI's ChatGPT

ChatGPT and InstructGPT are language models developed by OpenAI, designed to engage in dialogue with humans and follow instructions in a text, respectively. With advanced natural language processing capabilities, ChatGPT can understand and respond to a wide array of user queries with high accuracy, detail, and context-appropriateness. InstructGPT, on the other hand, has been trained to follow task-oriented instructions in a text, making it especially adept at tasks such as providing instructions or explanations. The ability of these models to handle complex conversations and follow-ups makes them valuable assets for ensuring effective, efficient, and nuanced communication during emergencies. With their incorporation in AI-enabled chatbots, ChatGPT and InstructGPT offer promising avenues for advancing emergency management and societal resilience.

### 5.4 Conclusions

AI-enabled chatbots represent a promising tool for enhancing societal resilience during emergencies and disasters. The ENGAGE project and its partners are committed to developing this technology, addressing its limitations, and expanding its strengths. Future endeavors will focus on developing different prototypes, exploring personalization of emergency plans, and continuing to bridge the gap between AI advancements and the readiness of authorities and first responders.

In conclusion, AI-enabled chatbots offer an unprecedented opportunity to enhance societal resilience in emergencies and disasters. By addressing their current limitations and harnessing their strengths, we can create a future where disaster management is more effective, responsive, and efficient. Policymakers, researchers, and practitioners alike need to take collaborative action to leverage this promising technology for societal benefit.

## 5.5 Recommendations

Based on our work on ENGAGE, we developed several recommendations regarding the use of AI-enabled chatbots in communication with the public in regard to emergencies and disasters.

1. Address technological limitations: Enhance the capabilities of AI chatbots to better understand context and to provide more accurate and less ‘creative’ responses.
2. Public feedback and involvement: Engage the public in developing and refining these AI-enabled chatbots.
3. Training and readiness: Improve training and preparedness of authorities and first responders to make the most out of AI advancements.
4. Continue Research: Enhance the ongoing development of AI-enabled chatbots by further researching, testing, and refining these technologies.

The policy initiatives around the use of AI-enabled chatbots in emergency management should support the development of technical standards and ethical guidelines for chatbots’ use during crises. Government, emergency authorities, and tech companies should work collaboratively to standardize how these technologies communicate with the public, ensure their information accuracy, and guarantee user privacy protection.

A collaborative approach is key to optimizing the use of AI-enabled chatbots in emergency management. Partnerships should be fostered among tech companies, emergency management authorities, academia, and civil society. These collaborations can facilitate the sharing of knowledge, best practices, and technology transfer, enhancing the efficiency and effectiveness of AI chatbots during crises.

Regulations and policies governing the use of AI chatbots should be reviewed and updated to align with the rapid technological advances. The regulatory framework should ensure the ethical use of AI, safeguard user privacy, and promote transparency in how chatbots process and use data.

Educating the public about AI chatbots and their role in disaster management is essential to foster trust and encourage their use during emergencies. Awareness campaigns should be conducted to inform the public about how to interact with these chatbots, what type of information they can provide, and how they can support individuals during disasters.

AI-enabled chatbots have significant ethical implications. These include data privacy issues, the potential spread of misinformation, algorithmic bias, and accountability. Policymakers and chatbot developers must work together to develop ethical guidelines that ensure the technology is used responsibly and in a way that respects user privacy and promotes transparency.

AI-enabled chatbots should be designed to integrate seamlessly with existing emergency management systems. This will allow for a more coordinated response to disasters, reduce duplication of efforts, and ensure that the chatbots can effectively work within the broader disaster management framework.

Research into AI-enabled chatbots for emergency management is still in its early stages. Further research is needed to understand these technologies’ full potential, limitations, and how they can best be utilized. Future research could focus on understanding user interactions with chatbots, investigating the effectiveness of different chatbot models, and exploring new applications for chatbots in disaster management.

In light of the above, the promise of AI-enabled chatbots in contributing to societal resilience during emergencies and disasters is undeniable. Their potential to provide rapid, reliable, and accurate information to citizens, emergency responders, and decision-makers can significantly enhance our ability to respond to and recover from crises. As we continue to explore the potential of this technology, we must also be mindful of the challenges and ethical considerations that it presents. By adopting a cautious, collaborative, and research-oriented approach, we can harness the power of AI chatbots to create safer, more resilient societies.

# Chapter 6: Prototype of an AI-enabled chatbot: Future directions for enhancing resilience

**Authors:** Rachele Gianfranchi, Solange Van Der Kolff, Menno Bot, Jumanah AlAwfi (One2Many, an Everbridge Company)

## 6.1 Introduction

The goal of the AI-enabled chatbot research and the subsequent development of the chatbot prototype can be summarized in three main targets: a) providing rapid 24/7 comprehensive information related to emergencies and disasters to diverse communities, b) reducing the workload on call-centers and first responders, and c) neutralizing false information to increase societal trust.

Research and technology offered us the opportunity to apply the investigation carried out by TAU to prototype a way to improve our public warning offering and communication with the public, as an opportunity to advance emergency management and resilience to risk. All these aspects contribute to a common goal: focusing on how to turn reliant communities into resilient societies.

## 6.2 From reliant to resilient: the development of the chatbot prototype

Can a chatbot contribute to societal resilience? Based on the blueprint and the review of chatbot solutions identified in Deliverable [D3.2](#), we concluded that the answer to this question should be positive, but should bear three challenges in mind: trust, rapidity, and effectiveness.

In an age of information overload and often dubious news, how can the chatbot ensure that a trustworthy message reaches the population? By neutralizing false information and by communicating from an officially recognized source – a government agency empowered by and prepared for emergency management. Panic and confusion can be generated by inappropriate messaging, which can result in bad advice being conveyed to the public when an emergency occurs.

The second and third considerations have to do with the ability of emergency authorities to provide a contextual, online, and zero-delay response to the public before, during, and after emergencies. In an emergency, time is of the essence. Being able to communicate key information rapidly and effectively is essential in order to bring people to safety and reduce the scale of loss and damage.

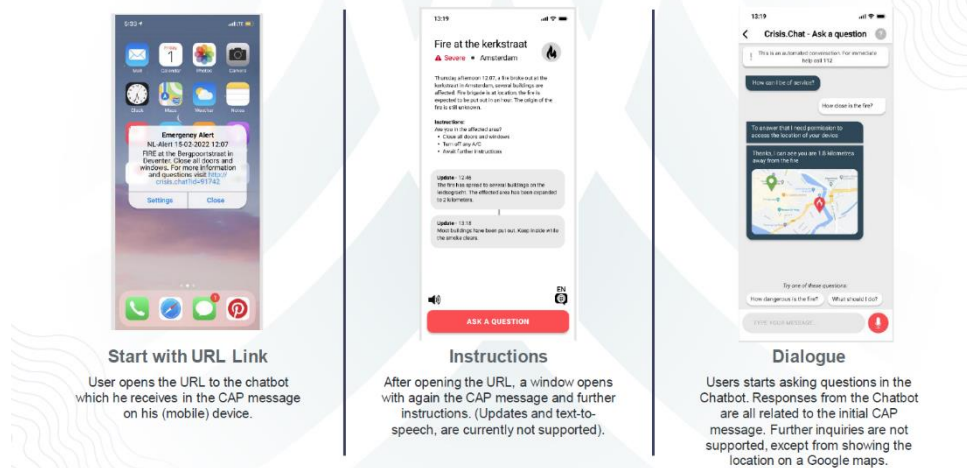
With these aspects in mind, the idea for the chatbot prototype was derived- one that could be linked to a public warning message (delivered through Cell Broadcast or Location-Based SMS) using the Public Warning System (PWS). Providing detailed information about the emergency from the PWS to chatbot is done using the open standard from OASIS named Common Alerting Protocol ([CAP](#)).

### 6.3 How would such a chatbot prototype work?

When a nature-derived or man-made hazard occurs, civil protection authorities can decide to send an alert using public warning technologies. One particular technology that is currently available to civil protection authorities is cell broadcast, which allows them to send alerts to the mobile phones of individuals who are present within a specific area where the event is either ongoing or likely to occur. These messages can be delivered within seconds and appear as a notification on the screen of a mobile phone along with a distinctive ringtone and vibration (European Emergency Number Association, n.d). The content of the messages includes information on the type of event that is occurring and instructions that individuals can take to protect themselves and others.

If the chatbot prototype were to be integrated within messages delivered by cell broadcast, it could be accessed by following a link at the bottom of the message, which would allow individuals to ask additional questions, such as: “How far away is the event from me?”. This development effectively makes the formerly “blind” public warning cell broadcast technology a way of facilitating multidirectional communication and enriches its capabilities to learn from human reactions. The questions received from citizens can be used to enrich the chatbot further using machine learning, making it increasingly capable of addressing societal needs in an emergency.

#### Chatbot Data Flow (2)



### 6.4 The rippled waves of technological progress

While the ENGAGE consortium advances its research into the chatbot prototype and approaches the last of a three-year project, technological advancements in the field of artificial intelligence have not stopped, which reveals new opportunities and challenges. OpenAI aims to create safe artificial general intelligence that benefits all of humanity. ChatGPT is a chatbot which can “*follow up questions, admit mistakes, challenge incorrect premises, and reject inappropriate requests.*” (Open AI, n.d). A recent hackathon organized by One2Many resulted in developing a data scraping tool to collect instructions for responding to hazards from the Federal Emergency Management Agency (FEMA) and integration with ChatGPT. An AI-model trained with these instructions will be incorporated in the chatbot in order to provide the context of the emergency to the chatbot based on the questions of the user. When tested, ChatGPT provided accurate answers, which was mostly

likely due to it having been trained using previous emergency instructions, civil defense websites, and news reports.

Progress in the field of artificial intelligence supported our research with a cloud-based, proprietary commercial tool trained on very broad sources of internet data, which resulted in unexpected possibilities for future research. The use of ChatGPT could include the FEMA instructions and could potentially be trained using additional data that researchers could provide. On the other hand, it is important to consider that it could also unexpectedly answer in very “creative” and broad terms, even when the context is fully provided. This is a trade-off that will require additional investment in research to avoid losing control over intentional answers currently provided by our original environment. From a controlled environment with DialogFlow, OpenAI enables the chatbot to handle a wide range of questions from users and massively increases data sources, which can impact the overall trustworthiness of the information.

### 6.5 New directions for the chatbot prototype

The 9th to the 12th of May, a live demonstration of the functioning of the chatbot took place in Târgu Mureș, Romania and included the circulation of a questionnaire to collect structured feedback from the participants. It was noted that the user-friendly interface, access to a map to visualize the distance from the hazard site, the ability to switch between languages, and the ability to consult the chatbot from a smartphone were the features that were appreciated the most. However, the possibility of receiving incomplete answers, a lack of inclusivity to different segments of the population and receiving a lot of additional information which is not necessarily relevant were aspects of the chatbot that were not appreciated by the participants.

During the brainstorming session that followed, ideas were shared on possible future enhancements to the chatbot which could improve its functioning and inclusivity. A few of these ideas included:

1. Providing comprehensive translation capability (alert, menu) and support audio
2. Supporting multimedia options using the Common Alerting Protocol (CAP)
3. Adding guidelines / repository per hazard type (including multimedia if available)
4. Enhancing (CAP) alerts with additional info like road closures, impact on livestock and pets, impact from pandemics, other emergencies
5. Make the Interface increasingly user-friendly.
6. Adding channels such as Voice and SMS
7. Faster access to emergency services with pre-configured emergency numbers
8. Researching alternatives for open or closed source AI tools that can be privately hosted.

### 6.6 Conclusions

The ENGAGE project has successfully showcased how dynamic, up to date and authorized information can be provided to the public with the help of a chatbot. Showing the public for the first time how the public warning chatbot works was made possible by integrating it into public warning systems and using cell broadcast or location-based SMS as a dissemination channel. By expanding to additional emergency related sources, the effectiveness can be increased even further.

One2many continues to strive to provide the best solutions for the community of emergency response practitioners and the chatbot could indeed be a valuable tool to increase resilience for the public. Focusing on technology readiness, with the private sector orientation to product development, this prototype could rapidly become a new real-world solution, meeting the needs of existing or future customers.

## 6.7 Recommendations

The project could not provide any training data for the chatbot nor statistics on popular questions during emergencies. Access to this data would still be valuable to confirm the chatbot capabilities and improve the natural language processing (NLP) capabilities that AI relies upon.

We briefly explored the usage of multimedia content for emergency warning information, but this was certainly not exhaustive. This could be further researched to significantly increase inclusiveness; for instance, a picture can say more than a thousand words.

The prototype currently includes commercial AI engines from 2 different vendors (Google Dialogflow and OpenAI ChatGPT). These 2 AI engines differ in the way they operate and the results that each achieves. That is why we saw the benefit of and chose to use the AI engines together, leveraging the advantages of each technology. From a cost perspective, it would be interesting to see if an open-source AI engine could be utilized providing similar functionalities. From a neutrality perspective, an open-source solution could help avoiding vendor lock-in or compliance issues in diverse geographies.

Whilst the project delivered a functional prototype, the solution could not be stress tested during a large-scale emergency. Furthermore, an emergency may also negatively impact availability of communication and resources that a chatbot might rely upon, which requires further research. Experimentation and testing would be useful in order to deliver a robust and performing solution under all circumstances. This performance must also include that of any AI component used in the solution. Possible technologies of interest may include Content Delivery Networks and Multi-Access Edge Computing.

# Chapter 7: From research to policy: Wrapping up the work of ENGAGE

Author: David Wales (EENA)

## 7.1 A citizen-driven approach to crisis communications

### 7.1.1 Who is a "citizen"?

Consideration of the Citizen is quite rightly at the heart of everything that is done in the disaster sector, and that has certainly been the case for the ENGAGE project. Throughout every work package, their virtual presence has provided a valuable reminder of the true purpose of our collective efforts. And yet, alongside this guiding light, is the recognition that the term 'citizen' is vastly inadequate in describing the diversity of needs and ability within a population of nearly 450 million people, extending over 27 member states (European Union, 2023).

This was a dilemma that we returned to frequently throughout the project, particularly when moving from theoretical discussions to the development of policy or practical deliverables. How to bridge the gap between the notion of a generic citizen, and the reality of designing policies, services or interventions that are suitable for a diverse range of individuals and communities, each with their own specific and dynamic characteristics.

Unsurprisingly, we did not entirely resolve this, and it is clear there is unlikely to ever be a singular answer. However, we hope that our experience and learning may prove useful to others as they too address the same challenge. The issues raised in this section are based on research undertaken for two policy papers produced by ENGAGE. These papers addressed the themes of 'Communicating with citizens in a crisis' (Wales et. Al, 2023) and 'Involvement of spontaneous volunteers in disaster management' (Wales et. Al., 2023).

### 7.1.2 Practical applications

Who is the citizen? According to the European Union, a citizen is defined as: "every person holding the nationality of a Member State is a citizen of the Union" (Maciejewski & Bux, 2023). When understood this way, the term 'citizen' serves a valuable purpose in providing a common and familiar word to underpin general discussions. It is helpful as a proxy for a universal but undefined citizen. However, when moving from a high-level or conceptual context to more practical use, its limitations become apparent. In fact, it exhibits some of the traits of a 'wicked'<sup>5</sup> problem and the implications of this may need further consideration. This is because in designing policies, services, or products, it is important to know the relevant and influential characteristics of those who are affected by or who will use them. For this, it is not possible to rely on a generic but unspecified notion of an average citizen.

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<sup>5</sup> A 'wicked' problem refers to one that is difficult or even impossible to solve because of requirements that are incomplete, contradictory and/or changing and are often difficult to recognize.



Research (primary or secondary) can of course help to address this and may be sufficient where the project or initiative has a tightly defined or specific audience. They are, in effect, knowable. However, in many cases the project beneficiaries will encompass a large and diverse population. In these cases, research alone may be insufficient.

Another approach often used to enhance knowledge of citizens is to consider what traits they commonly exhibit. Especially those that may have, or are perceived to have, a significant influence on their individual and collective capability and needs in relation to the issue concerned. It can help to identify the prevalence, distribution, and range etc of some factors e.g., financial and health data. But it is limited in its ability to understand the impact of these. It is also less suited to help with more subjective traits such as trust, willingness to help/contribute, attitudes and lived experience.

A further challenge is that each of these traits come with its own level of complexity. Individual circumstances, context, and outlook mean their relevance between individuals with the same trait can vary considerably. Citizens may often exhibit multiple traits which, in combination, increases the inherent variability and complexity. As such, despite the obvious appeal for organisations to use data and classification systems, understanding citizens through singular and homogenous categories does not accord well with the reality of people's lives in which the traits are experienced simultaneously and in combination.

So, how can we design singular interventions that will be suitable for application to citizens that include a diverse and, sometimes conflicting, range of characteristics?

### 7.1.3 Moving towards an integrated approach to disasters

It can be tempting, in the face of these questions, to default to the idea of an average citizen. In doing so it may be fully accepted that this approach will not serve some people or groups well. Alternatively, the intention may be to provide a quick solution for the majority needs and to then address specific minority requirements later. In practice, neither of these approaches tend to be successful or optimise the potential outcomes. They may even have the unintended consequence of creating or perpetuating social inequalities. This is where design-led approaches can complement research. Although it may sound counter-intuitive, actively tackling the most difficult requirements or use cases first often produces solutions that work well for everyone. Citizens know their own reality better than anyone else and those with unmet needs have often already developed their own solutions. By engaging with citizens directly throughout the process and using approaching such as co-creation, these will often be revealed at an early stage.

If the aspiration of an 'all of society' and integrated approach (UNDRR, 2023) to disasters is to be realised, then it is important to understand the citizen within their wider context and not just in isolation. Within this, the nature of their relationship with formal actors is particularly important. Through the advantages conferred by legislation, access to resources, political visibility and influence, the relationship is primarily determined by the formal agencies. Its principal characteristics are of a top down, command and control model in which citizens have limited independent means to act or influence the activities controlled by the agencies. The effect of this model over time has been to create a systemic imbalance which invests nearly all power and resources in institutions and representative bodies. In some respects, this has come at the expense of directly investing in citizens. In normal conditions, the impact of this imbalance is generally modest but under abnormal conditions (e.g., frequent, prolonged, or wide-scale disasters) the system becomes increasingly frail and prone to ineffectiveness.

In addition to the nature of formal mechanisms, there are multiple other, often dynamic, factors that influence the relationship between formal actors and citizens. For example, the role of trust featured significantly in ENGAGE and has been addressed in various outputs (Woerlein, 2022 & Elkady et. Al., 2022) Research identified that typically this topic is discussed in relation to the trust that citizens have in organizations. This remains important as it is their trust that gives all those involved in disaster risk reduction legitimacy. However, it is interesting to note that the trust that formal actors have in citizens does not seem to be as well understood or even monitored. And yet, our observations suggest that formal actors have low levels of trust in citizens capability and knowledge (see below). Combined with observed factors such as organisational risk aversion, incorrect assumptions, biases, and an attitude of being content with ‘meaning well’ this has a paralysing effect on the desire of formal actors to encourage citizens to develop their own capabilities and capacities. Instead, a culture of dependence on formal actors is preferred even though there are obvious limits to this strategy, especially during disasters.

#### 7.1.4 Recognizing the contributions of citizens

Reflecting some of the observations above, it was noted that recognition of the role that citizens currently play at every stage of disasters is typically under acknowledged. Data collection, academic studies, and other research organisations are often skewed towards a professional-centric view with limited, or lower, importance given to collecting and promoting the contributions of informal actors. The ability of citizens to be involved in each stage of the disaster cycle varies. However, the planning phase is perhaps the one that appears to be the least democratic and where they are most excluded as activities during this period are largely controlled by formal actors. In the response and recovery phase, some citizens may work alongside formal actors but there is also a large amount of essential activity being undertaken out of sight of, and beyond the involvement of formal actors. As a result, and despite the benefits it achieves, this often lacks recognition or investment.

Overall, the absence or limited representation of the essential contributions of citizens is unhelpful and reduces the likelihood of effective engagement and integration strategies. Again, the systemic imbalance in favour of the formal actors tends to work against citizens and greater equity or balancing mechanisms are required.

It is also important to note that citizens will often act or self-organise in ways that are different to the structures and cultures of formal actors. This is not always sufficiently appreciated, and it has been observed that many disaster strategies still seek to try and make citizens conform to the ways of working that organisations have chosen for themselves. These are not always natural, comfortable, or effective for citizens and the resultant tension or failure to achieve this aim can then further reinforce negative attitudes towards citizen involvement by formal actors.

Linked to, or possibly as a direct result of the above, another barrier to integration is the view that formal actors are responsible for citizens who engage in disaster work (International Organization for Standardization, 2017 & Department for Environment, Food & Rural Affairs, 2015). A view often accompanied by an explicit or implied sentiment of it often being too difficult to manage citizens and that doing so distracts them from their own tasks. Whilst it is reasonable and necessary for professionals to exercise control of defined areas posing a temporary high risk, it is not and cannot be a justification for excluding citizens from all other disaster-related activity at any stage. However, it is not unusual to hear exactly this. A common version uses a hypothetical case in which a well-meaning citizen tries to affect a rescue only to get in trouble, leading to additional casualties

(possibly to formal actors as well). Whilst this scenario is possible, it is also likely to be extremely rare and is clearly entirely unrepresentative of most citizen activity. Equally, but rarely acknowledged in the same way, are many examples of citizens engaging effectively to save lives in high-risk areas before formal actors are present or choose to deploy (Home Office of the United Kingdom, 2015 & Norges offentlige utredninger, 2012). This highlights the need for a more balanced and evidence-informed approach to discussing citizens.

It must also be remembered that disasters are often messy and, even as professionals at any stage of the care chain, there are times when unfortunately, our own actions lead to avoidable harm. We accept that this is, to some extent, inevitable and as humans we will make mistakes. We should not be intolerant of the same in others (citizens) or use it as a justification to exclude them. Professionals learn and train to improve – it would be helpful to adopt the same mentality towards citizens. The importance of citizen agency (their ability to take actions within their capacity) is also a very important factor in the recovery and wellbeing of individuals and communities which may require greater appreciation in future strategies.

The result of some of the above is that any activity undertaken by citizens is often assessed, not on its own terms for their motivation or the benefits achieved, but in relation to how much work or inconvenience it is believed to create for formal actors. This attitude is unhelpful and underpins an often-unchallenged rationale for obstructing rather than enabling greater citizen initiatives. In practice, being met with indifference or obstruction by formal actors rarely deters citizens but drives them to operate independently. This only further weakens the likelihood of achieving an integrated and whole society approach.

Ultimately, an inaccurate or partial knowledge and unfair representation of the citizen contribution (current and future) also inhibits the incentive for formal actors to find ways to enable citizens and communities to further develop their own resilience. Building resilience from the community upwards (as well as top down) represents a huge opportunity to tap into the vast array of assets (intellectual and physical) that citizens incorporate as well as the almost limitless capacity they offer.

It is also important to recognise that the citizen has multiple interests and roles in crises and disasters. These can range from funding formal actors via their taxes through to active participation in response or recovery efforts. Their specific interest and contribution will vary accordingly. This adds yet another layer of complexity when considering engagement with citizens. As previously discussed, the existing environment is largely configured for the benefit of formal actors. The timing, nature, and form of any engagement with citizens is normally controlled by them. This provides a valuable mechanism to meet their needs, but few options are provided for citizens to communicate in a way and at a time that suits them. This represents a significant gap as citizens and formal actors understand and experience disasters in very different ways. This means it can be hard for either party to appreciate or anticipate the concerns or priorities of the other. However, the requirements of all stakeholders are legitimate and relevant. But, in the absence of an appropriate and influential mechanism for citizens to make their voices heard, those of the formal actors dominate.

Helpfully, there are many intermediary agencies who work closely with citizens (e.g., academic, NGO's, charities, and regional/local governments). They all offer a valuable and accessible option to better understand citizens. However, they too have, by necessity, organisational priorities and filters which may influence their understanding or perspective.

This is why it is important to also have more ways to bring citizens directly into every stage of the disaster cycle. As discussed, it can be difficult to decide who to engage with, but, once that has been

decided, there are many well-established techniques available to facilitate the conversations and collaborative efforts.

Daunting as engaging citizens may seem, experience suggests that even amongst relatively small but diverse groups, the key issues will quickly emerge. Another consideration is to adopt a strategy of continuous engagement rather than doing so on a project-by-project basis. For example, informal methods- such relationship building and engagement with citizens in their communities- are an important and beneficial means to enhance ongoing knowledge, understanding and trust.

However, there is a need to be more proactive in meeting citizens where they are and designing systems and mechanisms specifically suited to their needs (through co-creation) as they are likely to be very different to those preferred by formal actors. This is to be expected and consideration will be needed with regard to creating an effective means by which the different but complementary systems can work together – in human terms as well as from a process perspective.

Ultimately, there is no way to understand and meet the needs of all citizens all the time. Hence, the design and development of any policy, service or other intervention will require a high degree of consideration and judgement. It is important to understand the nature of the challenge and framing it as a ‘wicked’ problem may be helpful, both in its perspective and for its methodologies. Perfect interventions or outcomes are unlikely but there are opportunities to constantly improve.

In relation to citizens, this means a commitment to doing what is right and not what is easy. If citizens are deemed challenging or hard to reach, it is often a consequence of the systems adopted by formal actors. On that basis, there is an onus on formal actors to reflect on what changes they need to make to better serve citizens.

### 7.1.5 Conclusions

The term and notion of a citizen is well suited to high level or conceptual discussions. However, as it moves towards practical or operational use it becomes more problematic. It has characteristics of a ‘wicked’ problem and acknowledging this may offer new routes to developing solutions. For example, design-led approaches and co-creation.

The current disaster environment embeds an imbalance in favour of formal actors, and in doing so has unintentionally disadvantaged citizens. Creating greater equity in the system, would remove some of the impediments to integration, and enhance the ability to effectively prepare for, respond to and recover from disasters. Ensuring effective dialogue between citizens and formal actors will require new approaches to the way in which they interact. In combination, these offer the best opportunity for a whole society and integrated approach to resilience by recognising fully and fairly the role of both formal and informal actors. The principle should be to invest in those who are placed to meet the need, regardless of their role or affiliation.

Ultimately, citizens have a right to be heard and to participate in arrangements for the disasters that are increasingly visible to or directly affecting them. The available evidence confirms that they already exhibit a competence and willingness to make a positive contribution at every stage. However, if this is to be developed and fully realized, formal actors will need to adopt new mindsets and mechanisms. Ultimately, all of us working in the disaster sector have the privilege to do so because citizens trust us, quite literally with their lives and livelihood. They are not a distraction or problem, but very much a competent and capable part of the solution. We must face the challenge

of enabling their greater involvement with commitment and a full appreciation of the benefits it will bring.

## 7.2 Spontaneous volunteers

Within the volunteer landscape, those that are deemed to have acted ‘spontaneously’ seem to be the subject of particular interest and, to an extent problematic, to formal actors. As such, whilst volunteers are discussed in general elsewhere in this report, it is worth separately considering some of the issues that relate specifically to Spontaneous Volunteers (SVs).

More than any other class of volunteer, SVs represent an unknown because of who they are and because how they will volunteer cannot be known in advance. Perhaps ironically, for a sector whose work largely involves planning for the unknown, SVs seem to create a very mixed reaction amongst formal actors. For example, there is an often tentative or grudging acknowledgement that SVs can be useful. However, this is usually quickly countered with a more extensive and robust explanation of the risks and difficulties SVs create for formal actors. It is clear, however, that the debate is framed from the perspective of the formal actor and that this has a significant influence on how SVs are represented and engaged.

Despite the generic term, SVs can come in many guises and for the purpose of this discussion they will be considered under three headings. Each of which has its own characteristics, needs and opportunities.

### 7.2.1 Inadvertent spontaneous volunteers

This refers to those that find themselves essentially as an accidental SV by virtue of being unexpectedly involved in, or in close proximity to an event. This can include survivors or bystanders, although from a formal actor’s perspective, these may not always be considered as SVs. However, they are an important group because they have the opportunity to act before formal actors are present or deployed. It is also predictable that this group will usually be present, and this knowledge means that any response plans should anticipate their involvement.

There are enough case studies that dispel the notion of panic and selfish behavior as the norms amongst this group. Instead, they evidence the valuable role they often play in saving lives, rendering mutual assistance, and providing comfort in the early stages of an incident. Despite not choosing to be involved, they typically respond with bravery and concern for the welfare of others, even at the expense of personal risk.

There may be people with relevant specialist skills present amongst inadvertent SVs e.g. medical personnel. However, this is a random outcome, and it is likely that most of this groups actions will be self-directed in response to an assessment of the needs of others and their own needs/abilities at the time.

Prior to their arrival, formal actors will have little influence on inadvertent SVs, although remote options, such as video links sent to mobile phones, increasingly provide some possibilities. However, one of the key issues for working with this group is management of the transition period when formal actors arrive and start to assume responsibility. Subject to the prevailing risks, this should be

done with sensitivity and an appreciation of the contribution of the inadvertent SVs.

### 7.2.2 Co-working spontaneous volunteers

Co-working SVs are those that intentionally choose to volunteer in response to an event and who do not fall within the above group. Co-working SVs either want to, or can be persuaded to work under, the direction or control of a formal actor but will not have an existing affiliation or relationship with them.

This may involve them working in or around the incident scene, but it can also include working at remote locations in supporting roles. Within the domain of the formal actors, this group is the one that is perhaps most often thought of when using the term SV. The main topic addressed in relation to co-operative SV's is in terms of an assessment of their perceived value (to formal actors) versus the cost (resource and time) of managing them. Given the pressure on their own resources at the time of an emergency, this means that formal actors have tended to actively discourage or reject the involvement of co-working SV's.

As the scope, scale and duration of emergencies increases, this is unlikely to be a sustainable strategy. It risks formal actors finding themselves being overwhelmed when additional community assistance is readily available. As such, it may be beneficial to reframe the problem. To move away from seeing it primarily as one of the ways that co-working SVs impact formal actors to finding different perspectives that offer new solutions. For example, considering the potential role and needs of co-working SVs in terms of developing a whole of society and integrated approach. Because of their willingness to work alongside formal actors, this group of SVs represent a valuable opportunity to proactively develop community capabilities and capacities.

### 7.2.3 Independent spontaneous volunteers

This third group are those who choose to help in some way but do not seek to do so through, or in co-operation with, formal actors. This group is perhaps the least well known as they may be missed from routine studies or post-incident inquiries. Their activities will tend to be outside of risk areas and may be more oriented towards logistical matters. People may find themselves independent SVs for many reasons. Some of these may be considered as lacking sufficient knowledge about formal actors and how to approach them, or it may be due to them having had a bad experience when they tried to do so, or it may be the result of a personal preference to work independently.

Within the independent SVs there are different sub-groups. Foremost among these are those who work at a community level carrying out roles that do not involve or require formal actors. Some of these may be seen as low-level tasks but they often represent an important factor contributing towards societal resilience. They also often involve tasks that the community deem important, but which are not seen as a priority or relevant by formal actors. This is to be expected and just reflects the way in which formal actors and communities will experience the same emergency very differently.

Another group are those who see a gap in provision or may believe they can do something better or quicker than formal actors. This is in many ways a very interesting group. They represent an innovation zone and may tend to have specialist skills and networks that are outside those available

to formal actors. They may also include people with emerging specialties or equipment that are yet to find their way into the domain of formal actors. Either way, there is scope for a beneficial relationship with this group if it is actively pursued.

One of the concerns that formal actors may have about independent SVs is that their actions are not always subject to an appreciation of how things work, especially where it involves international efforts and diplomacy. Where this creates a discernible risk then it is clearly a fair point, and thought should be given to appropriate solutions with the aim of still enabling independent SVs to participate in a positive way.

The challenge for coordinating activity with this group is that whilst the work of some of them may come to the attention of formal actors, many others may not be visible. A greater understanding of the motivations and methodologies of the independent SV is required before the issues can be fully appreciated. And co-creation with independent SVs will be an especially important approach to developing an effective solution.

#### 7.2.4 Conclusions

Spontaneous Volunteers make a valuable contribution through the response and recovery phases. Their experience could (or should) also feed in the planning phase.

Discussion and consideration of SVs is often framed through the lens of the formal actor and how SVs impact their plans and processes. This creates a language and mindset that may impede progress towards a whole of society approach, or effective use of valuable resources.

It also undermines an important ethical consideration that revolves around the right of citizens to help, and whether (or under what circumstances) it is a choice that should be imposed on them by formal actors. This is not by reference to prevailing legislation but more about the relationship between state institutions and citizens/communities.

The three categories of SV's discussed above each have their own characteristics and challenges, and any efforts to improve integration will need to reflect this.

# Chapter 8: Conclusions: Taking an interdisciplinary approach to enhancing societal resilience

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The results of ENGAGE were the accumulation of three years of work and would not have been possible without collaboration and knowledge-sharing across sectors. In practice, this involved coordination between researchers, practitioners, end-users, technology providers, and engineers within ENGAGE, and external consultations and collaborations with citizens, the wider research community, first responders, public authorities, and policy makers. In fact, the level of nuance and robustness that our results were able to achieve can be attributed just as much to the input and co-creation processes that emerged from these external consultations as it can be attributed to the myriad of backgrounds and expertise that the consortium brought to the table. This is why, to conclude this white paper, we will highlight the contributions of our advisory board, the Knowledge and Innovation Community of Practice (KI-CoP), to the ENGAGE project, which has been perhaps the most prominent means of facilitating interdisciplinary collaboration throughout the past three years.

## 8.1 Engaging the community of practice

To favour the collaboration and interaction between different actors of society, the project consortium was complemented by a special advisory board: the Knowledge and Innovation Community of Practice (KI-CoP). The KI-CoP is formed of practitioners, NGOs, Virtual Operations Support Teams, scientists, researchers, and citizens' representatives supporting ENGAGE as users and co-owners of its solutions. We approached the advisory board as an open community that experts could join throughout the project duration. This ensured rich input and fresh perspective at all stages of the project. At the end of the project, the KI-CoP consisted of 90 experts, from 25 different countries. Many experts that registered for the KI-CoP at the beginning of the project, were not active anymore towards the end. However, until the end of the project, new members registered and participated actively in events. Once there were more tangible project results, it also became easier to attract and actively engage KI-CoP members.

The KI-CoP was regularly involved in workshops and webinars to share experience, gather a critical view on project work, co- create, adapt, and validate project results. The inclusion of the KI-CoP in the activities ensured the validation and transferability of solutions, guidelines and methods across different risk and disasters scenarios. For example, the KI-CoP members tested various versions of the Catalogue of Solutions. Moreover, the community of practice saw potential to integrate the ENGAGE Knowledge Platform in systems already used by authorities and first responders. The members' contribution has been invaluable to give shape to the projects' results from the early stage and to stimulate the exploitation of the results.

We also discussed what the future of the advisory board should be after the end of the project. The KI-CoP members concluded that the community of practitioners built throughout the project can be utilized after the project ends by:



- **Networking and consortium building:** Use the community as a resource for forming consortiums and engaging experts in future projects.
- **Organizing events and trainings:** Plan online and in-person events, courses, and trainings to foster continued learning and interaction.
- **Database for advisory board members:** Create a database that other projects can use to access expert advisory board members.

By leveraging the connections and expertise within the community, valuable knowledge sharing, collaboration, and mutual support can be maintained, ensuring the sustainability and growth of the community beyond the project's completion.

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